

2001 Chevrolet S10 Pickup

2001 MANUAL TRANSMISSIONS Manual Transmission - NV 1500 - Sonoma & S10 Pickup

2001 MANUAL TRANSMISSIONS

Manual Transmission - NV 1500 - Sonoma & S10 Pickup

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Backup Lamp Switch	37 N-m	28 lb ft
Bearing Retainer Bolts	29 N-m	21 lb ft
Clutch Actuator Bolt	8 N-m	71 lb in
Clutch Housing Cover Bolts	14 N-m	10 lb ft
Oil Drain and Fill Plugs	30 N-m	22 lb ft
Shift Boot Screws	2 N-m	18 lb in
Shift Housing to Transmission Bolts	20 N-m	15 lb ft
Shift Lever Nut	48 N-m	35 lb ft
Vehicle Speed Sensor	16 N-m	12 lb ft
Transmission-to-Engine Studs and Bolts	47 N-m	35 lb ft
Transmission Mount to Transmission Bolts	45 N-m	33 lb ft
Transmission Mount to Cross Member Nut	57 N-m	42 lb ft

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Fig. 1: Fastener Tightening Specifications
Courtesy of GENERAL MOTORS CORP.

LUBRICATION SPECIFICATIONS

Application	Specification	
	Metric	English
NV1500		
Synchro-Mesh Transmission Fluid With Friction Modifier GM P/N 12377916	2.7 l	2.9 qt

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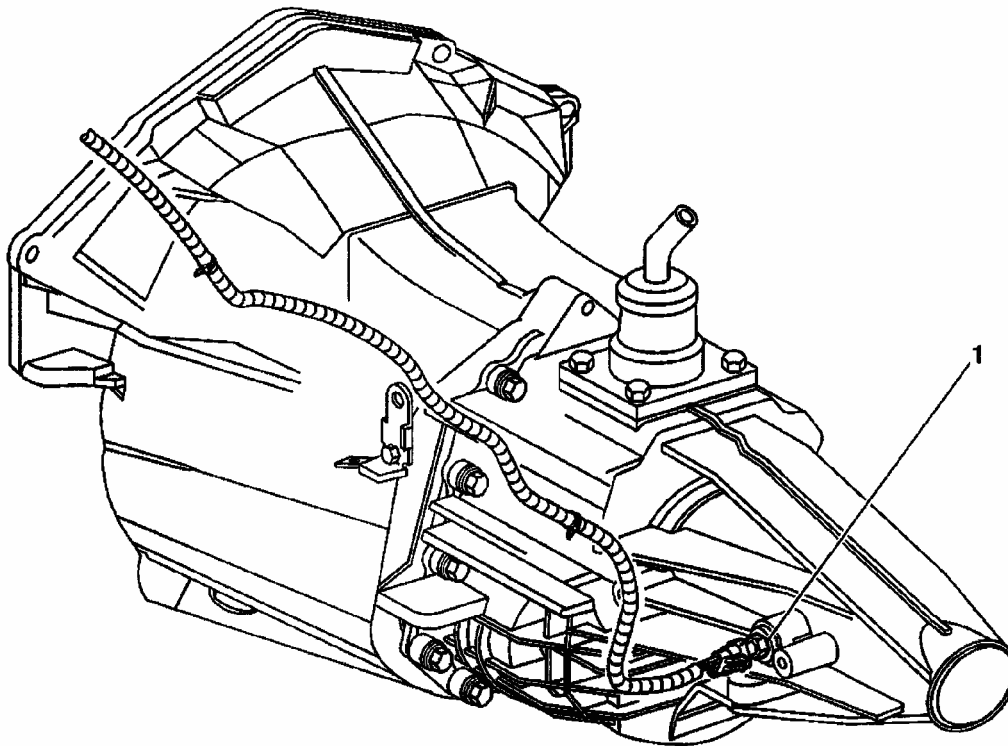
Fig. 2: Lubrication Specifications

COMPONENT LOCATOR

MANUAL TRANSMISSION COMPONENT VIEWS

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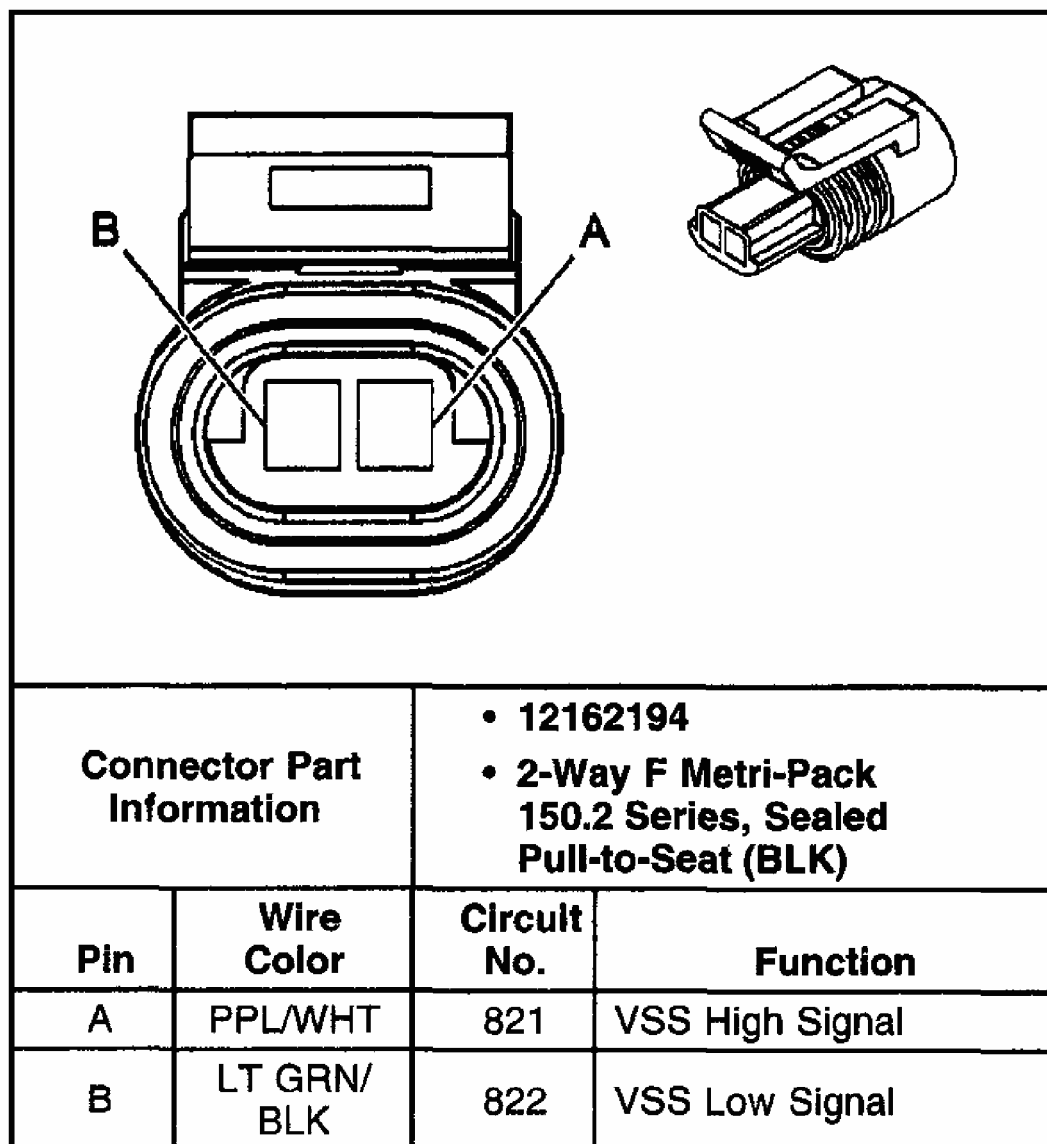


(1) Vehicle Speed Sensor (VSS)

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Fig. 3: Locating Vehicle Speed Sensor (VSS)

MANUAL TRANSMISSION CONNECTOR END VIEWS



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Fig. 4: Vehicle Speed Sensor (VSS) Connector Terminals

DIAGNOSTIC INFORMATION & PROCEDURES

DIAGNOSTIC STARTING POINT - MANUAL TRANSMISSION

Reviewing the description and operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the description and operation information will also help you determine if the condition described by the customer is normal operation. Refer to **TRANSMISSION SYSTEM DESCRIPTION & OPERATION** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

DIAGNOSTIC SYSTEM CHECK - MANUAL TRANSMISSION**Circuit Description**

IMPORTANT: Do not perform this check if no driveability condition exists.

The Diagnostic System Check is an organized approach to identifying a condition created by an electronic engine control system malfunction. The Diagnostic System Check is the starting point for any driveability diagnosis. This directs the service technician to the next logical step in order to diagnose the condition. Understanding the table and using it correctly will reduce diagnostic time, and will prevent the replacement of good parts.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

1

In order to correctly diagnosis any driveability malfunctions, the scan tool must be able to power-up.

2

The diagnostic tables in this portion of the service manual are designed for use with a properly functioning scan tool. Serial data communication must be corrected before beginning any other diagnostic procedures. Class 2 serial data will not transmit if the system voltage is less than 9 volts or greater than 16 volts.

5

By storing the Freeze Frame and Failure Records data on the scan tool, an electronic copy of the data is created when the malfunction occurred. This information is stored on the scan tool and can be referred to later. Type C DTCs do not store Freeze Frame data. If this option is not available, manually record the information for later reference.

6

If multiple DTCs are stored, diagnose in the following order:

1. System voltage DTCs
2. PCM Error DTCs
3. Component level DTCs, or DTCs that indicate a malfunctioning part
4. System level DTCs, or DTCs that indicate a system malfunction

9

After the engine is at normal operating temperature, comparison of actual control system data with the typical values is a quick way to determine if any parameter is not within limits. Keep in mind that a base engine problem such as advanced cam timing may substantially alter sensor values.

Inspect the following sensors for proper operation:

- The engine coolant temperature (ECT) sensor:
Inspect for an initial coolant temperature reading that is close to ambient, then observe the rise in temperature to the normal operating temperature while the engine is warming up.
- The throttle position (TP) sensor:
Inspect for proper sweep 0-100 percent.
- The manifold absolute pressure (MAP) sensor:
Inspect for quick changes during changes in various engine loads.
- The oxygen sensor (O2S 1):
Inspect for proper rich/lean and lean/rich sweeps in operation.
- The idle air control (IAC) valve:
Inspect for proper idle control and proper transition while operating the high load components, such as the air-conditioning (A/C) control.
Inspect the sensors for proper operation during warm-up. It can be a crucial step in correctly diagnosing any driveability concern. Careful observation of these sensors during engine warm-up may reveal a slow responding sensor or a sensor that malfunctions only within a small portion of its range.
Review any published service bulletins that relate to the exhibited symptoms or to components operation.

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Step	Action	Value(s)	Yes	No
1	Important: <ul style="list-style-type: none"> Do NOT perform this test if no driveability condition exists. Search for applicable bulletins before proceeding with the diagnosis. Do not turn OFF the ignition when performing this diagnostic table. Do NOT clear the DTCs unless the diagnostic instructs you to do so. If there is a condition with the starter system, refer to <i>Diagnostic System Check - Engine Electrical</i> in Engine Electrical article. Ensure the battery is fully charged and the cables are clean and tight. Ensure the PCM grounds are clean, tight, and in the proper location. 1. Install a scan tool to the data link connector (DLC). 2. Turn ON the ignition, with the engine OFF. Does the scan tool power up?	—	Go to Step 2	Go to <i>Scan Tool Does Not Power Up</i> in Data Link Communications article
2	Does the scan tool display PCM data?	—	Go to Step 3	Go to <i>Scan Tool Does Not Communicate with Class 2 Device</i> in Data Link Communications article
3	Attempt to start the engine. Does the engine start and continue to run?	—	Go to Step 4	Go to <i>Engine Cranks but Does Not Run</i> in Engine Controls – 2.2L article
4	Using the scan tool, check the following modules for DTCs: 1. PCM 2. BCM Does the scan tool display any PCM DTCs?	—	Go to Step 5	Go to Step 7
5	Record the Freeze Frame and Failure Records information with the scan tool. Did you complete the action?	—	Go to Step 6	—
6	Were any of the PCM DTCs P0601, P0602, or P1621?	—	Go to <i>DTC P0601-P0607, P1600, P1621, P1627, P1680, P1681, or P1683</i> in Engine Controls – 2.2L article	Go to <i>Diagnostic Trouble Code (DTC) List</i> in Engine Controls – 2.2L article
7	Were any BCM DTCs set?	—	Go to <i>Diagnostic Trouble Code (DTC) List</i> in Body Control System article	Go to Step 8

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Fig. 5: Diagnostic System Check - Manual Transmission (Steps 1-7)

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Step	Action	Value(s)	Yes	No
8	Is the customer concern with the Inspection/Maintenance (I/M) testing?	—	Go to <i>Inspection/Maintenance (I/M) System Check</i> in <i>Engine Controls – 2.2L</i> article	Go to <i>Step 9</i>
9	1. Allow the running engine to reach operating temperature. 2. Compare the scan tool data with the typical values shown in the Scan Tool Data List. Are the display values normal or within typical ranges?	—	Go to <i>Step 10</i>	Go to <i>Diagnostic Trouble Code (DTC) List</i> in <i>Engine Controls – 2.2L</i> article
10	If the customer concern is a symptom, refer to the following tables: <ul style="list-style-type: none"> • <i>Transmission Shifts Hard</i> • <i>Gear Clash When Shifting Gears</i> • <i>Transmission Noisy</i> • <i>Transmission Does Not Shift into One Gear</i> • <i>Transmission Jumps Out of Gear</i> • <i>Transmission Locked in One Gear</i> • <i>Clunk on Acceleration or Deceleration</i> • <i>Malfunction Indicator Lamp (MIL) Inoperative</i> in <i>Engine Controls – 2.2L</i> article. • <i>Malfunction Indicator Lamp (MIL) Always On</i> in <i>Engine Controls – 2.2L</i> article. Did you complete the action?	—	System OK	Go to <i>Intermittent Conditions</i> in <i>Engine Controls – 2.2L</i> article

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Fig. 6: Diagnostic System Check - Manual Transmission (Steps 8-10)

TRANSMISSION SCAN TOOL DATA LIST

Use the scan tool data values under the following conditions:

- The Powertrain On-Board Diagnostic (OBD) System Check is complete.
- The On-Board Diagnostics are functioning properly.
- No DTCs are present.

The following values represent a typical display recorded from a properly functioning system.

IMPORTANT: Do not use a scan tool that displays faulty data. Report the condition to the scan tool manufacturer. The use of a faulty scan tool can result in misdiagnosis and the unnecessary replacement of parts.

Only the parameters listed are used in this manual for diagnosing. If a scan tool displays other parameters, the values are not recommended by General Motors for use in diagnosis.

Scan tool values were recorded under the following conditions:

- Engine At Idle
- Upper Radiator Hose Hot

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- Closed Throttle
- Transmission In Neutral
- Closed Loop Operation
- Accessories OFF
- Brake Pedal Not Applied

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Vehicle Speed Sensor	ALL	km/h (mph)	0
*Data List Legend <ul style="list-style-type: none">• F0: Engine Data 1• F1: Engine Data 2• F2: Engine Data 3• F3: EVAP Data• F4: Fuel Trim Data• F5: Misfire Data	---	---	---

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Fig. 7: Transmission Scan Tool Data List

TRANSMISSION SCAN TOOL DATA DEFINITIONS

The Transmission Scan Tool Data Definitions contain a brief description of manual transmission related parameters available on the scan tool. The list is in alphabetical order.

Vehicle Speed Sensor: Range 0-255 km/h (0-255 mph). The vehicle speed sensor signal is converted into km/h (mph) for display. The vehicle speed output from the PCM is 4,000 pulses per mile. The scan tool uses the Class 2 serial data from the PCM to obtain vehicle speed, while the instrument panel cluster, cruise control module and multi-function alarm module use the 4,000 ppm output.

DIAGNOSTIC TROUBLE CODE (DTC) TYPE DEFINITIONS

Diagnostic trouble codes (DTCs) are categorized into emissions and non-emissions related types. If a DTC is set, the malfunction indicator lamp (MIL) and failure data are utilized by the control module diagnostic executive according to the DTC type. Each DTC is set based upon the individual DTCs running and setting criteria. Read the Action Taken When the DTC Sets and Conditions for Clearing the MIL/DTC in the supporting text for taking appropriate action to each DTC.

Emissions Related DTCs

Type A

The following actions occur at the time of the first failure:

- The MIL is turned ON.
- A DTC is stored in memory.

- The Freeze Frame/Failure Records is stored.
- The Failure Records are updated after the first failure of each ignition cycle.

Some Type A DTCs will not perform the above actions when the DTC first detects a failure. Two consecutive failures are required. This allows systems, such as evaporative emission (EVAP), to accurately identify what failure exists before setting a DTC and requesting MIL illumination.

Type B

The following actions occur at one of the following times:

- First failure:
 - The MIL is not turned ON.
 - A DTC is stored in memory as a Failed Last Test.
 - The Failure Records is stored.
- Second consecutive drive cycle with a failure:
 - The MIL is turned ON.
 - A DTC is stored in memory as a history DTC.
 - The Freeze Frame data is stored.
 - The Failure Records is stored.
- Second non-consecutive drive cycle with a failure:
 - The MIL is not turned ON.
 - A DTC is stored in memory as a Failed Last Test.
 - The Failure Records is stored.

Non-Emissions Related DTCs**Type C**

The following actions occur at the time of a failure:

- The MIL does not turn ON.
- A DTC is stored in memory as a history DTC.
- The Failure Records is stored.
- The Failure Records are updated after the first failure of each ignition cycle.
- Some Type C DTCs may also cause an auxiliary service lamp to be illuminated, and/or display a message to the vehicle operator.

Type X

Actions did not occur. These DTCs are coded into the control module software, but will not

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run for one of the following reasons:

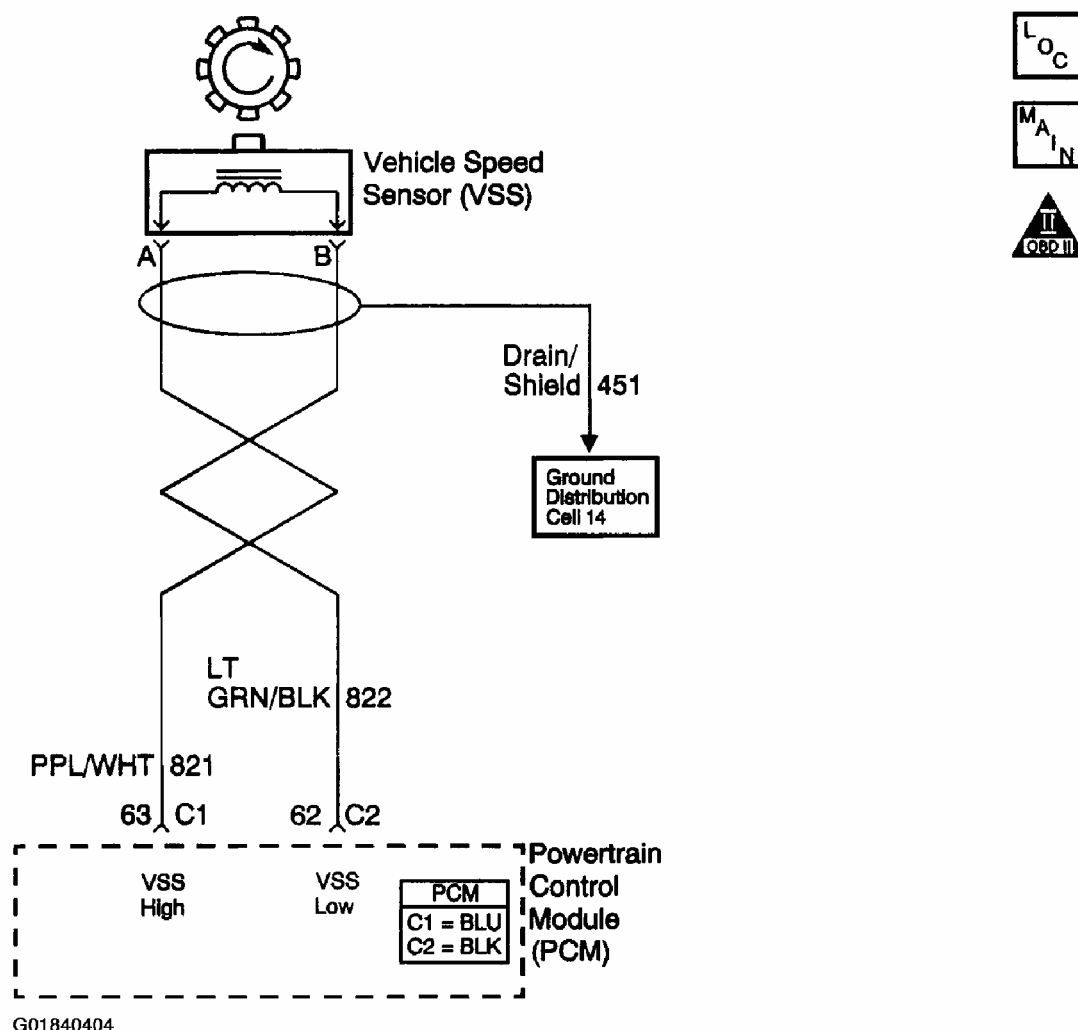
- The associated hardware is not installed with the vehicle emission package.
- The diagnostic is not required for the vehicle emission package.

Diagnostic Trouble Code (DTC)	Domestic	Export Unleaded Fuel
DTC P0502	A	A

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Fig. 8: Diagnostic Trouble Code (DTC) List/Type

DTC P0502



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Fig. 9: DTC P0502 Wiring Schematic

Circuit Description

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The vehicle speed sensor (VSS) assembly provides vehicle speed information to the powertrain control module (PCM). The VSS assembly is a permanent magnet generator. The VSS produces alternating current (AC) as the rotor teeth on the output shaft of the transmission pass through the magnetic field of the sensor. The frequency and amplitude of the AC waveform both increase as vehicle speed increases.

If the PCM detects no vehicle speed for a specified length of time while other sensors indicate that the vehicle is moving, DTC P0502 sets. DTC P0502 is a type A DTC.

Conditions For Running DTC

- DTCs P0107, P0108, P0122, and P0123 are not set.
- The engine speed is 1,700-3,600 RPM.
- The throttle position (TP) is 0-1 percent.
- The engine vacuum is 80-70 kPa.
- The above conditions are met for 5 seconds.

Conditions For Setting DTC

The vehicle speed is less than 3 km/h (2 mph).

Action Taken When DTC Sets

- The malfunction indicator lamp (MIL) illuminates.
- The PCM records the operating conditions when the Conditions for Setting the DTC are met. The PCM stores this information as Freeze Frame and Failure Records.
- Cruise Control is disabled.
- The coolant fan turns ON.
- The PCM stores DTC P0502 in PCM history.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL during the third consecutive trip in which the diagnostic test runs and passes.
- The PCM cancels the DTC default actions when the fault no longer exists and the DTC runs and passes.
- A history DTC will clear after 40 consecutive warm-up cycles without a fault.
- A scan tool can clear the MIL/DTC.

Diagnostic Aids

Ensure the VSS is correctly torqued to the transmission housing.

Test Description

The numbers below refer to the step numbers on the diagnostic table. See **Fig. 10** and **Fig. 11** .

5

The resistance measurement will not change if either the VSS high signal circuit or the VSS low signal circuit, but not both, is shorted to ground. The vehicle speed detector in the PCM and the VSS are matched in such a way that an open or a short to ground in the VSS low signal circuit will not usually cause a loss of speed signal or a DTC P0502 to set. The lower resistance value given represents the nominal resistance specification of the VSS at -40°C (-40°F), minus the manufacturing tolerance specification of 10 percent. The higher resistance value given represents the nominal resistance specification of the VSS at 150°C (302°F), plus the manufacturing tolerance specification of 10 percent.

8

This step isolates the short between the VSS and the wiring.

10

Do not skip Step 7. The DMM will detect AC voltage if the VSS high signal circuit is shorted to ground.

13

The replacement PCM must be programmed and the crankshaft position system variation procedure must be performed. Refer to **PROGRAMMING** .

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Step	Action	Value(s)	Yes	No
1	Did you perform the <i>Diagnostic System Check - Manual Transmission</i> ?	—	Go to <i>Step 2</i>	Go to <i>Diagnostic System Check - Manual Transmission</i>
2	<p>Notice: In order to avoid damage to the drive axles, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel.</p> <ol style="list-style-type: none"> 1. Install a scan tool. 2. Turn ON the ignition with the engine OFF. <p>Important: Record the Failure Records before clearing the DTCs. Using the Clear Info function erases the Failure Records from the PCM.</p> <ol style="list-style-type: none"> 3. Record the DTC Freeze Frame and Failure Records. 4. Clear the DTC. 5. Raise the drive wheels. 6. Start the engine. 7. Allow the engine to idle in gear. <p>Does the scan tool display vehicle speed above the specified value?</p>	0 km/h (0 mph)	Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Turn ON the ignition with the engine OFF. 3. Review the Freeze Frame data and note the parameters. 4. Start the engine. 5. Operate the vehicle within the Freeze Frame conditions, and the Conditions For Running The DTC. <p>Does the scan tool display vehicle speed above the specified value?</p>	0 km/h (0 mph)	Go to <i>Intermittent Conditions in Engine Controls - 2.2L article</i>	Go to <i>Step 4</i>
4	<ol style="list-style-type: none"> 1. Verify that the latest calibration is installed in the PCM. 2. Update the PCM with the latest calibration as necessary. <p>Did the PCM require a calibration update?</p>	—	Go to <i>Step 14</i>	Go to <i>Step 5</i>
5	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the PCM. 3. Measure the resistance between terminal C1 63 and C2 62. <p>Is the resistance within the specified range?</p>	966–2200 Ω	Go to <i>Step 7</i>	Go to <i>Step 6</i>

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Fig. 10: DTC P0502 Diagnostic Table (Steps 1-5)

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Step	Action	Value(s)	Yes	No
6	Test the VSS high signal and VSS low signal circuits for the following conditions: <ul style="list-style-type: none"> An open circuit or high resistance condition. VSS high signal and VSS low signal circuits shorted together. Refer to <i>Circuit Testing</i> in Wiring Systems article. Did you find and correct a condition?	—	Go to Step 14	Go to Step 11
7	Measure the resistance between terminal C1 63 and ground. Is the resistance greater than the specified value?	50 K Ω	Go to Step 10	Go to Step 8
8	1. Leave the DMM connected between terminal C1 63 and ground. 2. Disconnect the VSS. 3. Measure the resistance between terminal C1 63 and ground. Is the resistance greater than the specified value?	50 K Ω	Go to Step 11	Go to Step 9
9	Repair the short to ground in the VSS high signal circuit. Did you complete the repair?	—	Go to Step 14	—
10	1. Connect the DMM between terminal C1 63 and C2 62. 2. Using the DMM, measure the AC voltage while rotating the drive wheels by hand. Is the AC voltage equal to or greater than the specified value?	0.5 V	Go to Step 13	Go to Step 11
11	1. Remove the VSS. Refer to <i>Vehicle Speed Sensor (VSS) Replacement</i> . 2. Inspect the VSS and the VSS rotor for the following conditions: <ul style="list-style-type: none"> VSS damage VSS rotor damage Excessive air gap between the VSS rotor and the VSS Incorrect alignment between the VSS and the VSS rotor 3. Repair or replace any of the above items as necessary. Did you find and correct a condition?	—	Go to Step 14	Go to Step 12
12	Replace the VSS. Refer to <i>Vehicle Speed Sensor (VSS) Replacement</i> . Did you complete the repair?	—	Go to Step 14	—
13	Replace the PCM. Refer to <i>Powertrain Control Module (PCM) Replacement</i> in Engine Controls – 2.2L article. Is the action complete?	—	Go to Step 14	—
14	1. Using the scan tool, clear the DTCs. 2. Start the engine. 3. Idle at normal operating temperature. 4. Operate the vehicle within the Conditions for Running the DTC, as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	—	System OK	Go to Step 2

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Fig. 11: DTC P0502 Diagnostic Table (Steps 6-14)

SYMPTOMS - MANUAL TRANSMISSION

Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to **TRANSMISSION SYSTEM DESCRIPTION & OPERATION**.

Visual/Physical Inspection

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- Inspect the manual transmission for excessive wear or damage.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the manual transmission for the correct fluid level.
- Inspect the manual transmission for fluid leaks.
- Inspect the manual transmission for broken or loosen transmission mounts.

Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Transmission Shifts Hard. See **TRANSMISSION SHIFTS HARD** .
- Transmission Shifts Hard Into Reverse. See **TRANSMISSION SHIFTS HARD INTO REVERSE** .
- Gear Clash When Shifting Gears. See **GEAR CLASH WHEN SHIFTING GEARS** .
- Transmission Noisy. See **TRANSMISSION NOISY** .
- Transmission Does Not Shift into One Gear. See **TRANSMISSION DOES NOT SHIFT INTO ONE GEAR** .
- Transmission Jumps Out of Gear. See **TRANSMISSION JUMPS OUT OF GEAR** .
- Transmission Locked in One Gear. See **TRANSMISSION LOCKED IN ONE GEAR** .
- Clunk on Acceleration or Deceleration. See **CLUNK ON ACCELERATION OR DECELERATION** .

TRANSMISSION SHIFTS HARD

Diagnostic Aids

Hard shifting can be diagnosed easily. You should also perform a static shift and a dynamic shift test. Many simple factors could occur such as excessive clutch pedal free travel, insufficient fluid, excessive fluid or even the wrong transmission lubricant. A misaligned transmission can also cause hard shifting as well as a worn or defective clutch, binding of the shift control. Many internal components can also play a factor in hard shifting such as the front bearing retainer loose or cracked, synchronizer worn, damaged or improperly assembled. A failure to fully depress the clutch pedal when shifting will cause hard shifting.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4

This step checks for air in the hydraulic lines, this will also cause the transmission to hard shift.

6

This step checks for a faulty shift control.

10

This step checks for a faulty or worn clutch pressure plate or clutch driven plate.

Diagnostic Test

1. Did you review the manual transmission symptom operations and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect the clutch pedal travel. Is there sufficient clutch pedal travel? If yes, go to next step. If no, go to step 4 .
3. Remove any clutch pedal restrictions. Does the transmission shift hard? If yes, go to next step. If no, system is okay.
4. Test for air in the clutch hydraulic system. Is there air in the hydraulic system? If yes, go to next step. If no, go to step 6 .
5. Bleed the air from the clutch hydraulic system. Refer to **BLEEDING** in Clutch. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
6. Inspect the transmission shift control for binding. Is the transmission shift control binding? If yes, go to next step. If no, go to step 8 .
7. Replace the transmission shift tower. Refer to **SHIFT TOWER REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
8. Inspect the transmission for the correct type transmission fluid. Is the correct type fluid being used? If yes, go to step 10 . If no, go to next step.
9. Drain and refill the transmission with the correct type fluid. See **LUBRICATION SPECIFICATIONS** .
10. Inspect the clutch pressure plate and/or clutch driven plate. Is the clutch pressure plate and/or clutch driven plate worn or faulty? If yes, go to next step. If no, go to step [12](#) .
11. Replace the clutch pressure plate and/or clutch driven plate. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
12. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** . Inspect the

transmission for an internal bind, possibly caused by one of the following:

- Shift forks
- Selector plates
- Synchronizers

After locating internal bind, go to next step.

13. Replace worn or damaged components as necessary. Refer to **MANUAL TRANSMISSION - NV 1500** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If no, go to **Diagnostic Aids** .
14. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

TRANSMISSION SHIFTS HARD INTO REVERSE

Diagnostic Aids

Hard shifting in reverse can be diagnosed easily. You should also perform a static shift and a dynamic shift test. Many simple factors could occur such as excessive clutch pedal free travel, insufficient fluid, excessive fluid or even the wrong transmission lubricant. A misaligned transmission can also cause hard shifting as well as a worn or defective clutch, binding of the shift control. Many internal components can also play a factor in hard shifting such as the front bearing retainer loose or cracked, synchronizer worn, damaged or improperly assembled. A failure to fully depress the clutch pedal when shifting will cause hard shifting in reverse.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4

This step checks for air in the hydraulic lines, this will also cause the transmission to hard shift in reverse.

6

This step checks for a faulty shift control.

10

This step checks for a faulty or worn clutch pressure plate or clutch driven plate.

Diagnostic Test

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1. Did you review the manual transmission symptom operations and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect the clutch pedal travel. Is there sufficient clutch pedal travel? If yes, go to next step. If no, go to step 4 .
3. Remove any clutch pedal restrictions. Does the transmission shift hard? If yes, go to next step. If no, system is okay.
4. Test for air in the clutch hydraulic system. Is there air in the hydraulic system? If yes, go to next step. If no, go to step 6 .
5. Bleed the air from the clutch hydraulic system. Refer to **BLEEDING** in Clutch. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
6. Inspect the transmission shift control for binding. Is the transmission shift control binding? If yes, go to next step. If no, go to step 8 .
7. Replace the transmission shift tower. Refer to **SHIFT TOWER REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
8. Inspect the transmission for the correct type transmission fluid. Is the correct type fluid being used? If yes, go to step 10 . If no, go to next step.
9. Drain and refill the transmission with the correct type fluid. See **LUBRICATION SPECIFICATIONS** .
10. Inspect the clutch pressure plate and/or clutch driven plate. Is the clutch pressure plate and/or clutch driven plate worn or faulty? If yes, go to next step. If no, go to step [12](#) .
11. Replace the clutch pressure plate and/or clutch driven plate. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
12. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** . Inspect the transmission for an internal bind, possibly caused by one of the following:
 - Shift forks
 - Selector plates
 - SynchronizersAfter locating internal bind, go to next step.
13. Replace worn or damaged components as necessary. Refer to **MANUAL TRANSMISSION - NV 1500** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If no, go to **Diagnostic Aids** .
14. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

GEAR CLASH WHEN SHIFTING GEARS

Diagnostic Aids

Gear clash is a grinding noise that is made when shifting gears. If the transmission develops gear clash, first check the clutch adjustment or faulty clutch condition. A clutch that drags or does not fully engage is the most common cause of gear clash. If the clutch is at fault, the clash should occur in every gear. If the clutch is all right, or the clash does not occur in all gears, check for worn or damaged synchronizers, including the sleeves, hubs and the blocking rings. Also check for loose mounting bolts or misalignment. You should also perform a static shift and a dynamic shift test.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2

This step checks for proper clutch operations.

5

This step checks for air the hydraulic clutch system.

12

This step checks for worn or damaged internal components.

Diagnostic Test

1. Did you review the manual transmission symptom operations and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect for proper clutch operation. Refer to **SYMPTOMS - MANUAL TRANSMISSION** . Does the clutch operate properly? If yes, go to next step. If no, go to step 4 .
3. Verify that the clutch is releasing properly. Refer to **DESCRIPTION & OPERATION** . Is the clutch releasing properly? If yes, go to step 5 . If no, go to next step.
4. Repair the clutch system. Refer to **CLUTCH ASSEMBLY & PILOT BEARING** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
5. Test for air in the clutch hydraulic system. Is there air in the hydraulic system? If yes, go to next step. If no, go to step 7 .
6. Bleed the air from the clutch hydraulic system. Refer to **BLEEDING** in Clutch. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
7. Inspect the transmission control for wear. Is the transmission control worn? If yes, go to next step. If no, go to step 9 .
8. Replace the transmission shift tower. Refer to **SHIFT TOWER REPLACEMENT** .

Did you find and repair the condition? If yes, system is okay. If no, go to next step.

9. Inspect the transmission fluid level. Refer to **TRANSMISSION FLUID REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
10. Inspect the transmission for the correct type transmission fluid. Is the correct type fluid being used? If yes, go to step 12 . If no, go to next step.
11. Drain and refill the transmission with the correct type fluid. See **LUBRICATION SPECIFICATIONS** . Do the gears clash? If yes, go to next step. If no, system is okay.
12. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** . Disassemble and inspect the gear shift components and/or synchronizers for damage or wear. Refer to **MANUAL TRANSMISSION - NV 1500** . Are the gear shift and/or synchronizers worn or damaged? If yes, go to next step. If no, go to step 14 .
13. Replace worn and/or damaged components as necessary. Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
14. Inspect the clutch pilot bearing for binding. Is the pilot bearing binding? If yes, go to next step. If no, system is okay.
15. Replace the clutch pilot bearing. Refer to **CLUTCH ASSEMBLY & PILOT BEARING** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If no, go to **Diagnostic Aids** .
16. Operate the system and verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

TRANSMISSION NOISY

Diagnostic Aids

The manual transmission can be noisy for a number of reason, from being noisy in neutral, low, high and reverse gear. Diagnosis the transmission from the level of fluid to the right type of fluid in the transmission. Inspect for misalignment or loose bolts to the engine. The transmission could be noisy internally from the gears, synchronizers, bearings this should be inspected for worn or damaged parts. These are only a few areas that may cause the transmission to be noisy, you should inspect all possibilities that could lead you to the noise of these concerns.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4

This step is checking for the correct type of transmission fluid.

10

This step is checking for internal damage or worn parts.

Diagnostic Test

1. Did you review the manual transmission symptom operations and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect the transmission fluid level. Is the fluid level correct? If yes, go to step 4 . If no, go to next step.
3. Add transmission fluid. Refer to **TRANSMISSION FLUID REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
4. Inspect the transmission for the correct fluid type. Is the transmission fluid the correct type? If yes, go to step 6 . If no, go to next step.
5. Drain and refill the transmission with the correct type fluid. See **LUBRICATION SPECIFICATIONS** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
6. Inspect the shift control closeout boot. Is the closeout boot loose or damaged? If yes, go to next step. If no, go to step 8 .
7. Position and tighten the shift tower to specification, or replace the boot as necessary. Refer to **SHIFT TOWER REPLACEMENT** . Did you find and repair the condition?
8. Inspect the clutch housing for loose bolts and/or misalignment with the engine. Is there any loose bolts or misalignment with the engine? If yes, go to next step. If no, go to step 10 .
9. Tighten the clutch housing bolts to specifications. Refer to **FASTENER TIGHTENING SPECIFICATIONS** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
10. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** .
Disassemble and inspect the following transmission components for wear or damage:
 - Gear shift
 - Transmission gears
 - BearingsIs there any wear or damage? If yes, go to next step. If no, system is okay.
11. Replace worn or damaged components as necessary. Refer to **MANUAL TRANSMISSION - NV 1500** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If

no, go to **Diagnostic Aids** .

12. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

TRANSMISSION DOES NOT SHIFT INTO ONE GEAR

Diagnostic Aids

When the manual transmission will not transmit power from the engine to the wheels and one gear will not shift it is possible that the gear is stripped. If the transmission will not shift in all gears it is possible that the input or countershaft gears are stripped or a broken input or output shaft has occurred. Sometimes the transmission shift control may not be working correctly. You should also perform a static shift and a dynamic shift test.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2

This step checks for worn or damage shift control components.

4

This step inspects for any problems with the hydraulic system.

9

This step inspects for internal parts that may have worn or damaged components.

Diagnostic Test

1. Did you review the manual transmission symptom and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Check the operation of the transmission shift lever. Is the control worn, binding, or damaged? If yes, go to next step. If no, go to step 4 .
3. Replace the transmission shift lever. Refer to **SHIFT LEVER REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
4. Inspect the hydraulic clutch operation. Refer to **SYMPTOMS - MANUAL TRANSMISSION** . Is the clutch operating properly? If yes, system is okay. If no, go to next step.
5. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** . Inspect the concentric slave cylinder for being faulty or damaged. Is the concentric slave cylinder faulty or damaged? If yes, go to next step. If no, system is okay.

6. Replace the concentric slave cylinder. Refer to **CONCENTRIC SLAVE (ACTUATOR) CYLINDER** in Clutch. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
7. Inspect the pilot bearing and the input shaft. Is there signs of the input shaft binding in the pilot bearing? If yes, go to next step. If no, system is okay.
8. Replace the clutch pilot bearing. Refer to **CLUTCH ASSEMBLY & PILOT BEARING** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
9. Disassemble and inspect the following transmission internal components for wear or damage:
 - Gearshift components
 - Transmission gears
 - BearingsAre any of the components worn or damaged? If yes, go to next step. If no, system is okay.
10. Replace all worn or damaged components. Refer to **MANUAL TRANSMISSION - NV 1500** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If no, go to step **Diagnostic Aids** .
11. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to 1 .

TRANSMISSION JUMPS OUT OF GEAR

Diagnostic Aids

The manual transmission can have a number of problems to make it jump out of gear. You should also perform a static shift and a dynamic shift test. Some of the most common ones are misalignment of the transmission to engine, the clutch housing loose, or misalignment. The transmission should also be checked for worn or damaged input bushing to flywheel or worn or damaged input and output shaft bearings. An bent input shaft could also be the result of the transmission jumping out of gear. When going into the internal part of the transmission also check for worn detent springs, synchronizers, worn teeth on the gears or even worn thrust washers. When doing inspections of the manual transmission you should inspect all internal parts for worn or damaged parts.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

6

This step checks for worn or damaged transmission or engine mounts.

12

This step is checking for worn or damaged internal parts.

Diagnostic Test

1. Did you review the manual transmission symptom operations and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect the transmission shift tower. See **SHIFT TOWER REPLACEMENT** . Is the boot out of position? If yes, go to next step. If no, go to step 4 .
3. Reposition or replace the shift tower. Refer to Did you find and repair the condition? If yes, system is okay. If no, go to next step.
4. Inspect the transmission shift control. Is the shift lever loose or damaged? If yes, go to next step. If no, go to step 6 .
5. Replace the transmission shift lever. Refer to **SHIFT LEVER REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
6. Inspect the engine and/or transmission mounts. Are the engine and/or transmission mounts worn or damaged? If yes, go to next step. If no, go to step 8 .
7. Replace the engine mounts and/or transmission mounts. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
8. Inspect the engine and/or transmission mounts for loose fasteners. Are there any loose fasteners? If yes, go to next step. If no, go to step 10 .
9. Tighten the engine mount and/or transmission mount fasteners to specifications. Refer to **FASTENER TIGHTENING SPECIFICATIONS** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
10. Inspect the clutch housing for loose bolts or misalignment. Are there any loose bolts or misalignment? If yes, go to next step. If no, go to step 12 .
11. Tighten any loose housing bolts and/or align the housing. Refer to **FASTENER TIGHTENING SPECIFICATIONS** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
12. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** .
Disassemble and inspect the following internal components for wear or damage:
 - Gearshift
 - Transmission gears
 - Bearings

Is there any worn or damaged components? If yes, go to next step. If no, system is

okay.

13. Replace any worn or damaged components. Refer to **MANUAL TRANSMISSION - NV 1500** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If no, go to **Diagnostic Aids** .
14. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

TRANSMISSION LOCKED IN ONE GEAR

Diagnostic Aids

If the transmission is locked, engaging the clutch will kill the engine. If the shift control components and the clutch system operations are working properly, the problem is caused by internal damage, such as a dented or damaged shift fork, and the transmission must be removed from the vehicle for repairs. You should also perform a static shift and a dynamic shift test.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

7

This step is checking for a dented or damaged shift fork.

8

This step is checking for worn or damaged internal components.

Diagnostic Test

1. Did you review the manual transmission symptom and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect the transmission fluid level. Refer to Fluid Replacement. Is the transmission fluid level correct? If yes, go to step 4 . If no, go to next step.
3. Add transmission fluid if necessary. Can the transmission be shifted out of gear? If yes, system is okay. If no, go to step 5 .
4. Check for the correct type transmission fluid. Is the correct type transmission fluid being used? If yes, go to step 6 . If no, go to next step.
5. Drain and refill the transmission with the correct type fluid. Refer to **TRANSMISSION FLUID REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.

6. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** . Replace the concentric slave cylinder. Refer to **CONCENTRIC SLAVE (ACTUATOR) CYLINDER** in Clutch. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
7. Disassemble and inspect the transmission for a dented or damaged shift fork or any other gear train components. Is there a dented or damaged shift fork? If yes, go to next step. If no, system is okay.
8. Replace the worn or damaged components as necessary. Refer to **MANUAL TRANSMISSION - NV 1500** . Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, go to next step. If no, go to **Diagnostic Aids** .
9. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

CLUNK ON ACCELERATION OR DECELERATION

Diagnostic Aids

There are a few factors to know when there is a clunk in acceleration or deceleration. You should always check the engine mounts for looseness or damage. Also check the clutch driven plate to see if it is worn or damaged. Sometimes the clunk noise may come from worn or damaged universal joints.

Test Description

The number below refers to the step number on the diagnostic table.

2

This step inspects for loose or damaged engine mounts.

4

This step inspects for worn or damaged driven clutch plate.

6

This step inspects for worn or damaged universal joints.

Diagnostic Test

1. Did you review the manual transmission symptom and perform the necessary inspections? If yes, go to next step. If no, go to **SYMPTOMS - MANUAL TRANSMISSION** .
2. Inspect the engine mounts for looseness or damage. Are the engine mounts loose or

damaged? If yes, go to next step. If no, go to step 4 .

3. Tighten the engine mounts to specifications. Refer to **FASTENER TIGHTENING SPECIFICATIONS** . Replace the engine mounts. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
4. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** . Inspect the clutch driven plate hub for wear or damage. Did you find and repair the condition? If yes, system is okay. If no, go to next step.
5. Replace the clutch driven plate. Refer to **CLUTCH ASSEMBLY & PILOT BEARING** in Clutch. Install the transmission. Refer to **TRANSMISSION REPLACEMENT** . Did you find and repair the condition? If yes, system is okay. If no, go to next step.
6. Inspect the universal joints for wear or damage. Are the universal joints worn or damaged? If yes, go to next step. If no, system is okay.
7. Replace the universal joints. Did you find and repair the condition? If yes, go to next step. If no, go to **Diagnostic Aids** .
8. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 1 .

REPAIR INSTRUCTIONS

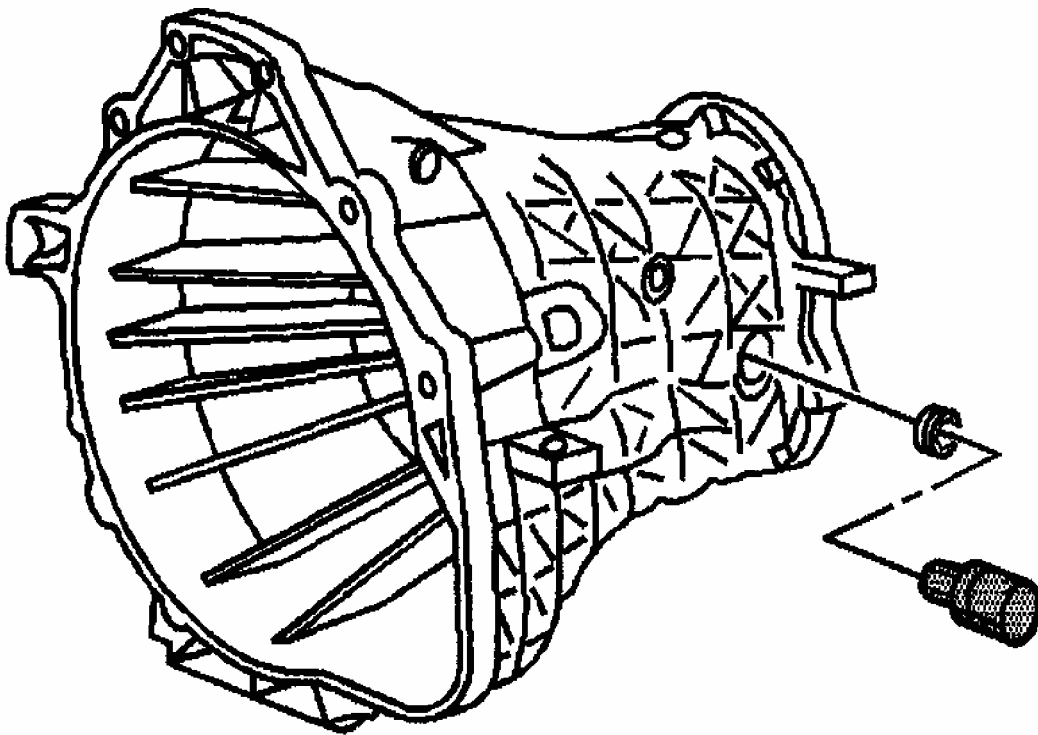
TRANSMISSION FLUID REPLACEMENT

Tools Required

J 36511 Oil Fill/Drain Plug Hex Bit (17 mm)

Removal Procedure

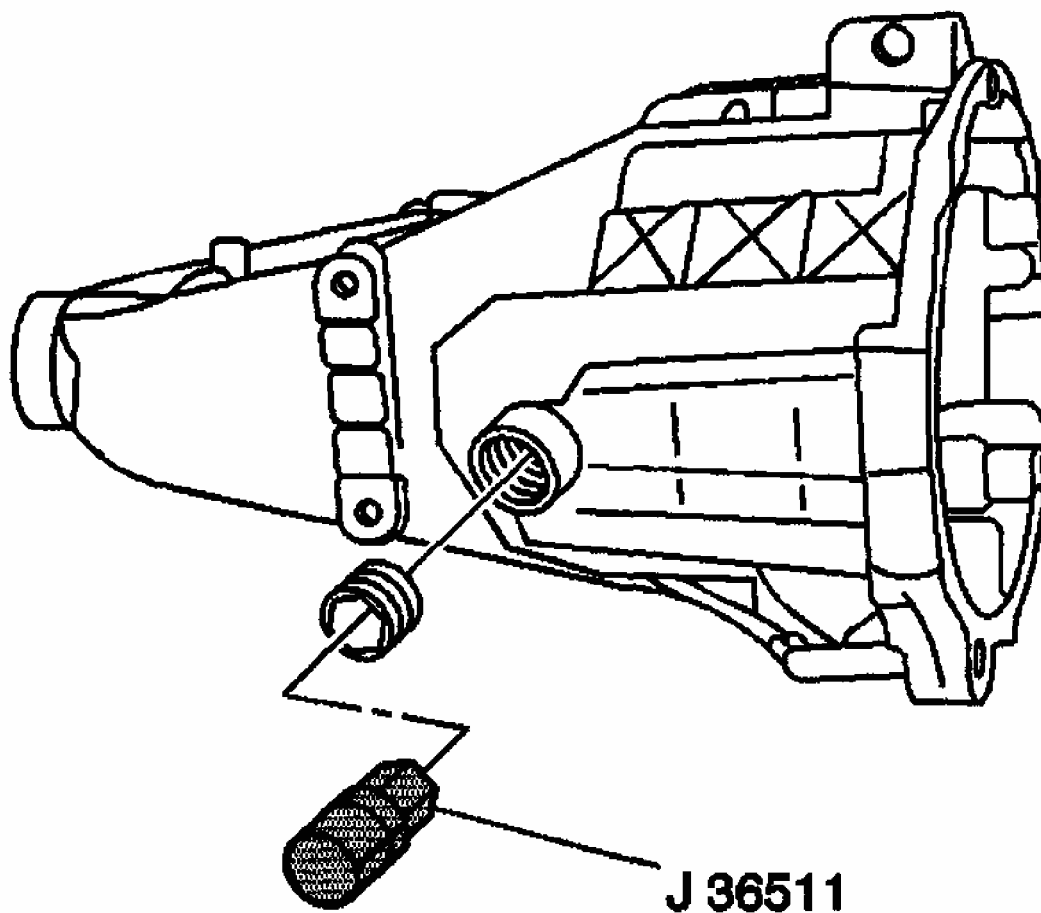
1. Raise the vehicle. Refer to Lifting & Jacking The Vehicle in General Information.
2. Thoroughly clean around the fill plug and the oil drain plug.
3. Use the *J 36511* in order to remove the oil fill plug.



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Fig. 12: Locating Oil Fill Plug

4. Catch the oil in a suitable container.
5. Use the *J 36511* in order to remove the oil drain plug.

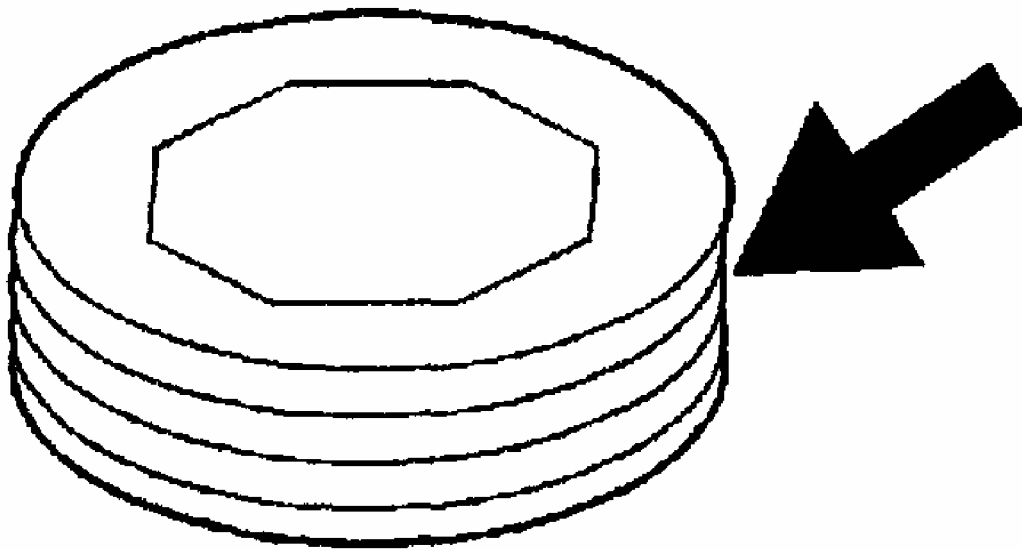


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Fig. 13: Locating Oil Drain Plug

Installation Procedure

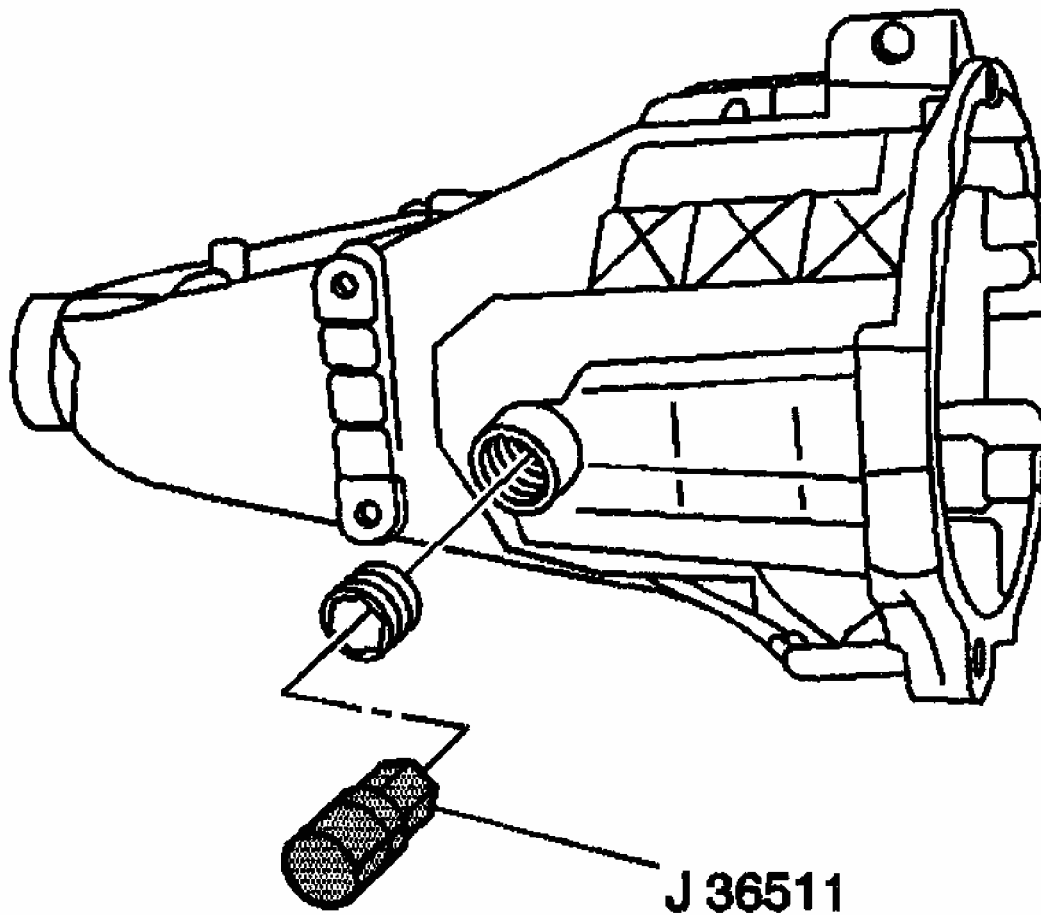
1. Apply sealant to the oil drain plug threads. Use Teflon(R) GM P/N 1052080, or the equivalent.



G01840418

Fig. 14: Applying Sealant To Oil Drain Plug Threads

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



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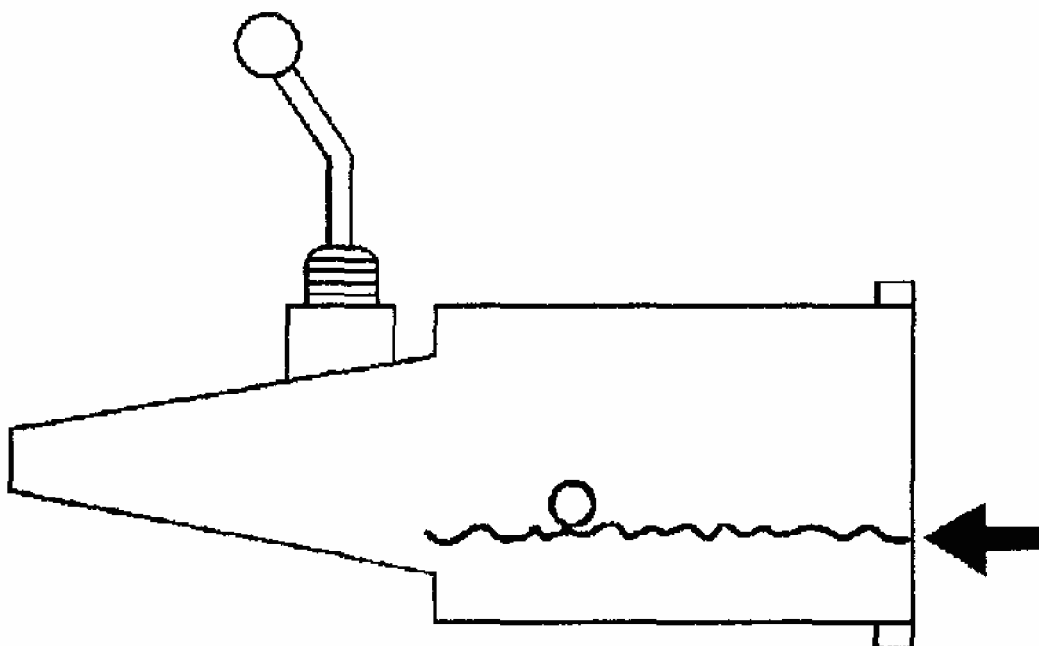
Fig. 15: Installing Oil Drain Plug

2. Use the *J 36511* in order to install the oil drain plug.

Tighten

Tighten the oil drain plug to 30 N.m (22 lb ft).

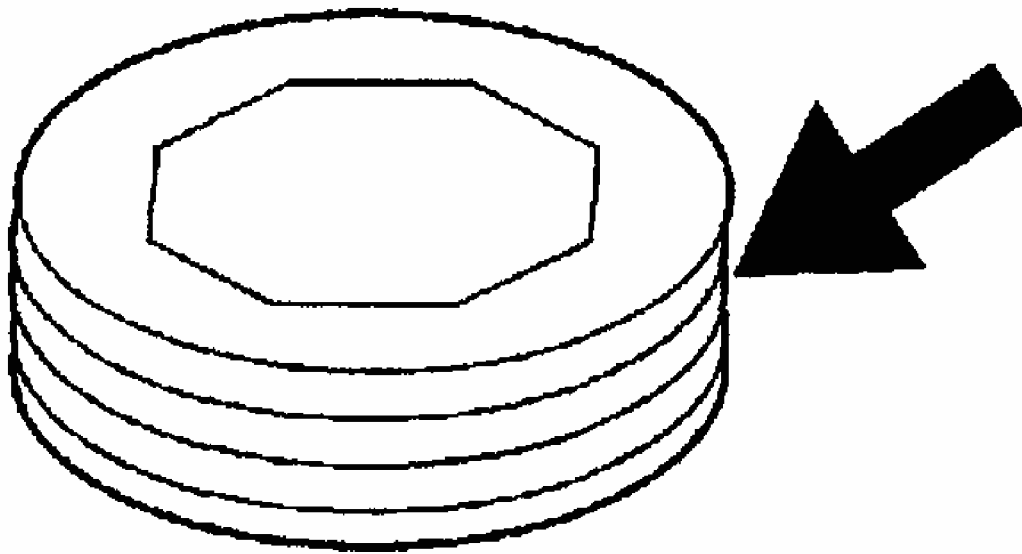
3. Fill the transmission to the level of the fill plug hole. Refer to **LUBRICATION SPECIFICATIONS** .



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Fig. 16: Identifying Transmission Fluid Level

4. Apply sealant to the oil fill plug threads. Use Teflon(R) GM P/N 1052080 or the equivalent.



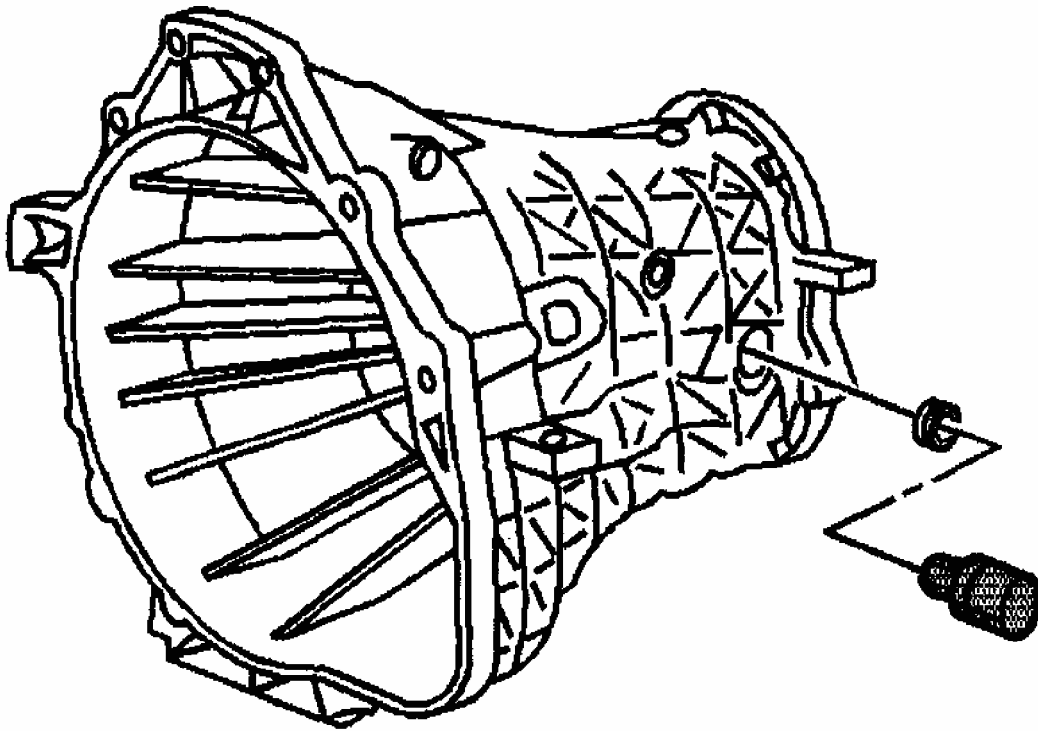
G01840421

Fig. 17: Applying Sealant To Oil Fill Plug Threads

5. Use the *J 36511* in order to install the oil fill plug.

Tighten

Tighten the oil fill plug to 30 N.m (22 lb ft).



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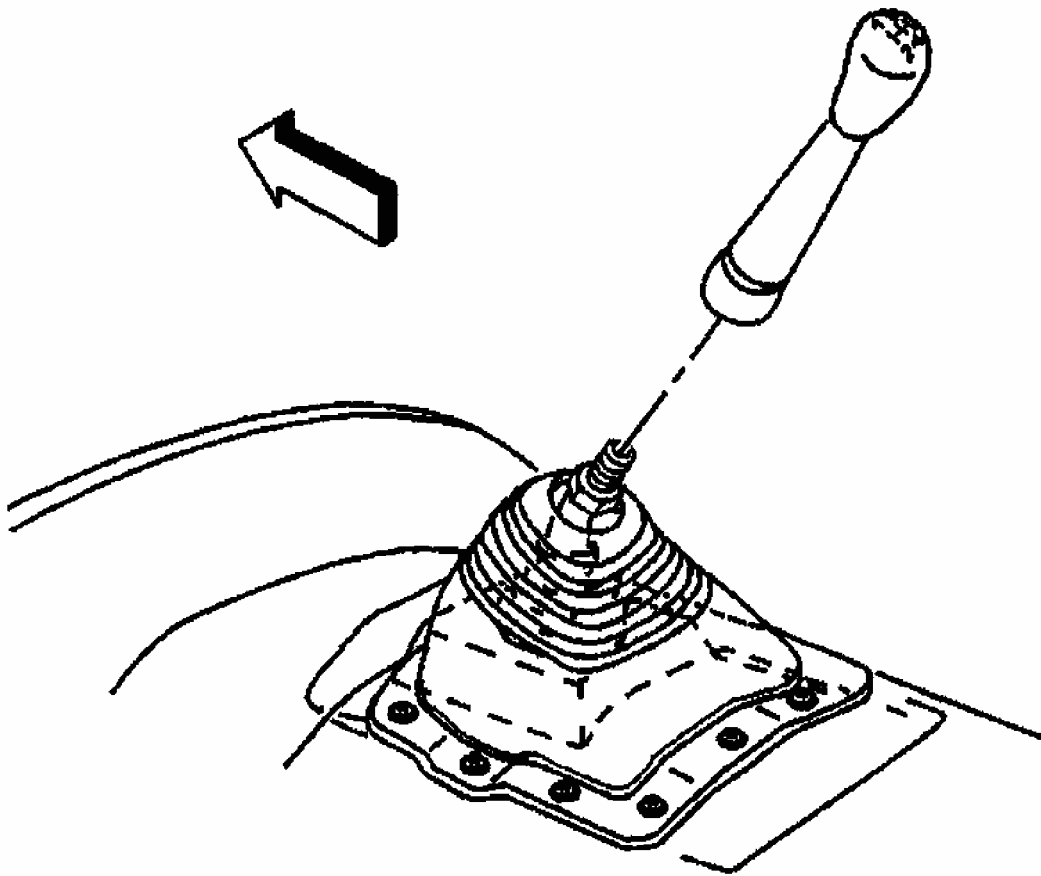
Fig. 18: Tightening Oil Fill Plug

6. Lower the vehicle.

SHIFT LEVER REPLACEMENT

Removal Procedure

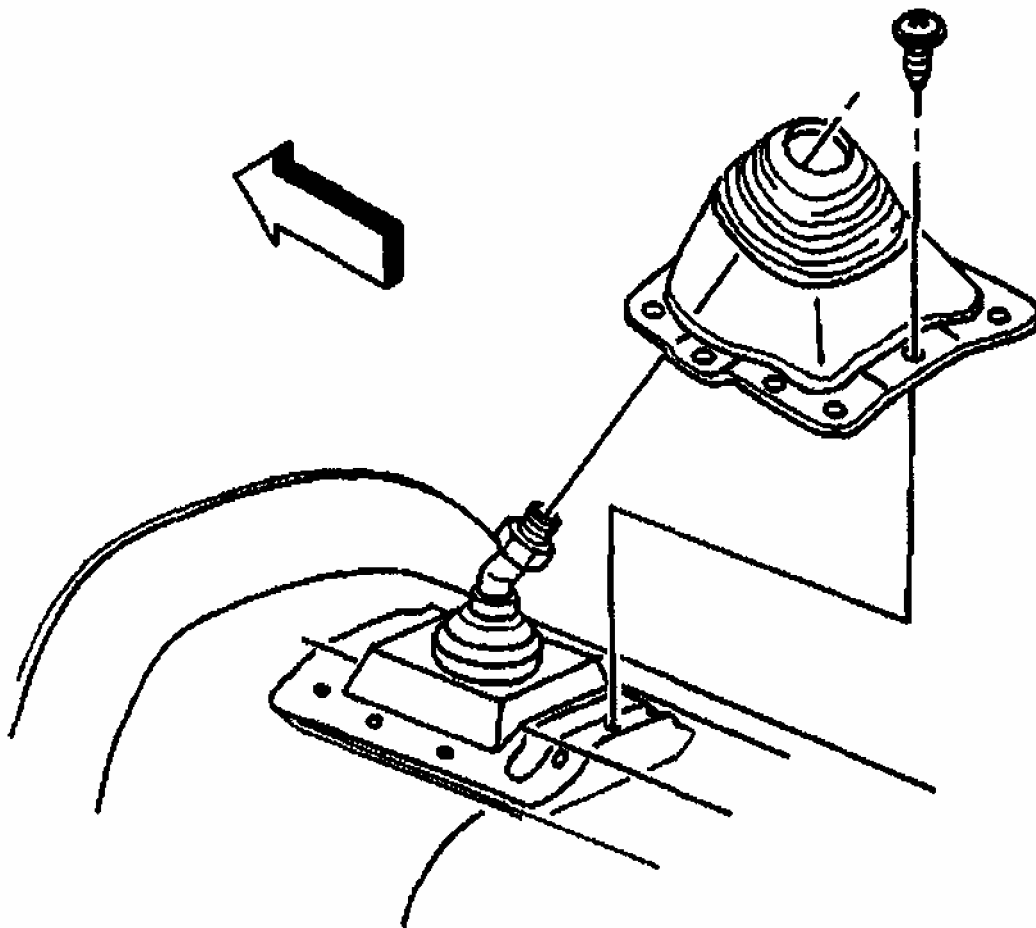
1. If equipped, remove the 3 console nuts and the console.
2. Remove the shift lever from the shift tower. Do not remove the shift lever adjusting nut.



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Fig. 19: Removing Shift Lever From Shift Tower

3. Pull back the carpet to access the screws.
4. Remove the screws securing the boot to the panel.



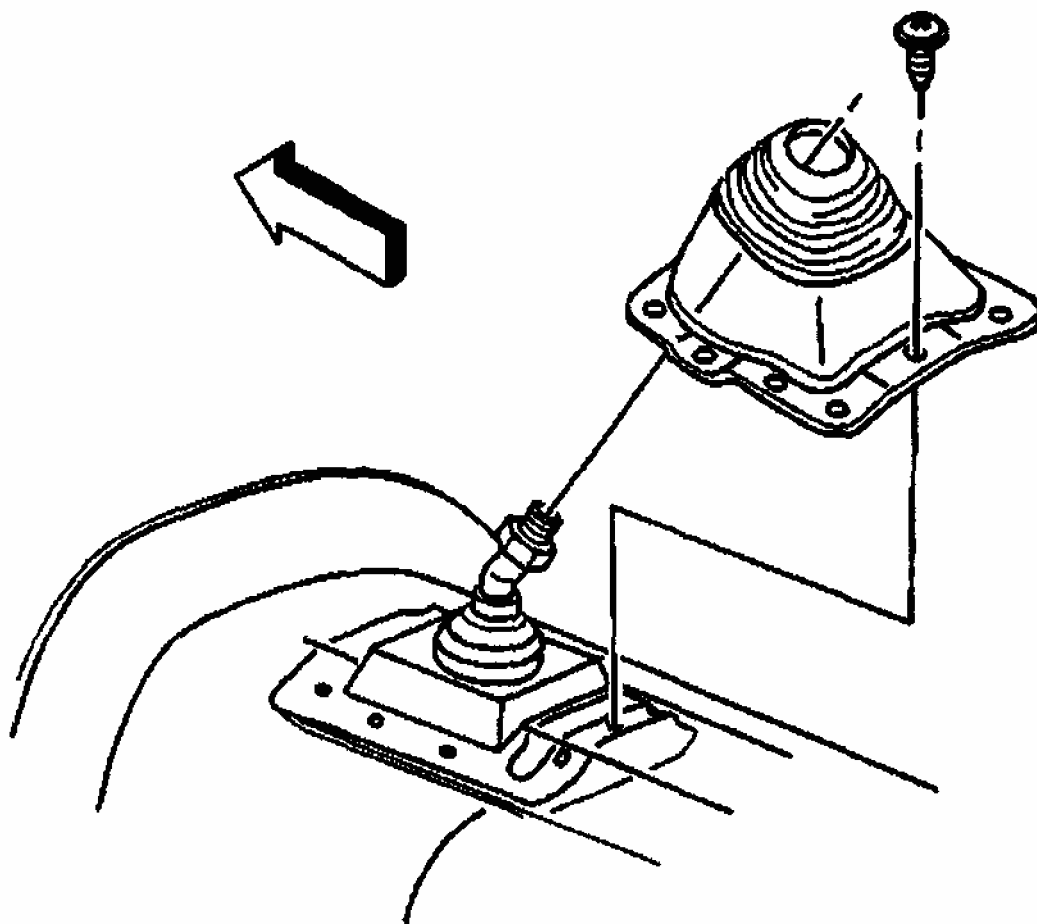
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Fig. 20: Removing Screws Securing Boot To Panel

Installation Procedure

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

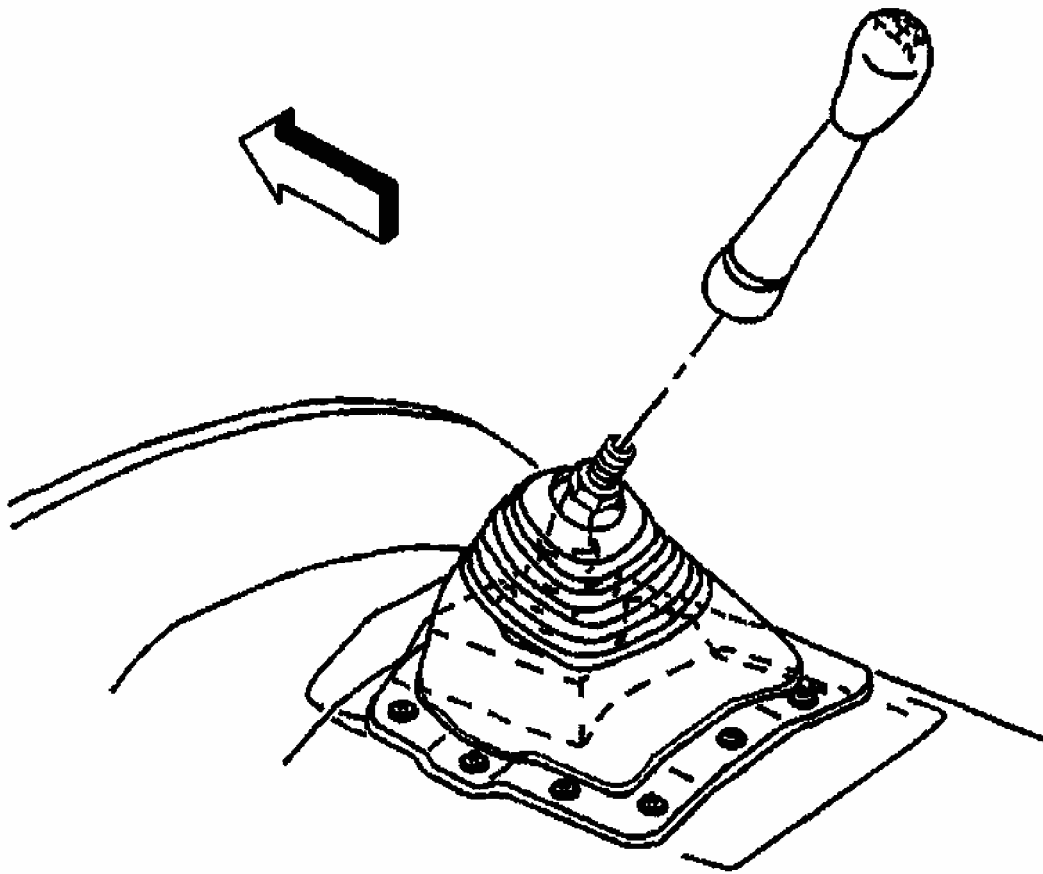
1. Install screws securing boot to panel. Tighten the screws to 2 N.m (18 lb in).



G01840425

Fig. 21: Installing Shift Boot Screws

2. Install the shift lever to the shifter.



G01840426

Fig. 22: Installing Shift Lever

3. Install the console and the 3 console nuts (If equipped). Tighten the nuts to 2 N.m (18 lb in).

SHIFT TOWER REPLACEMENT

Removal Procedure

IMPORTANT:

- Ensure that the shift lever is positioned into the mechanical third or fourth gear prior to removal of the shift housing from the transmission.

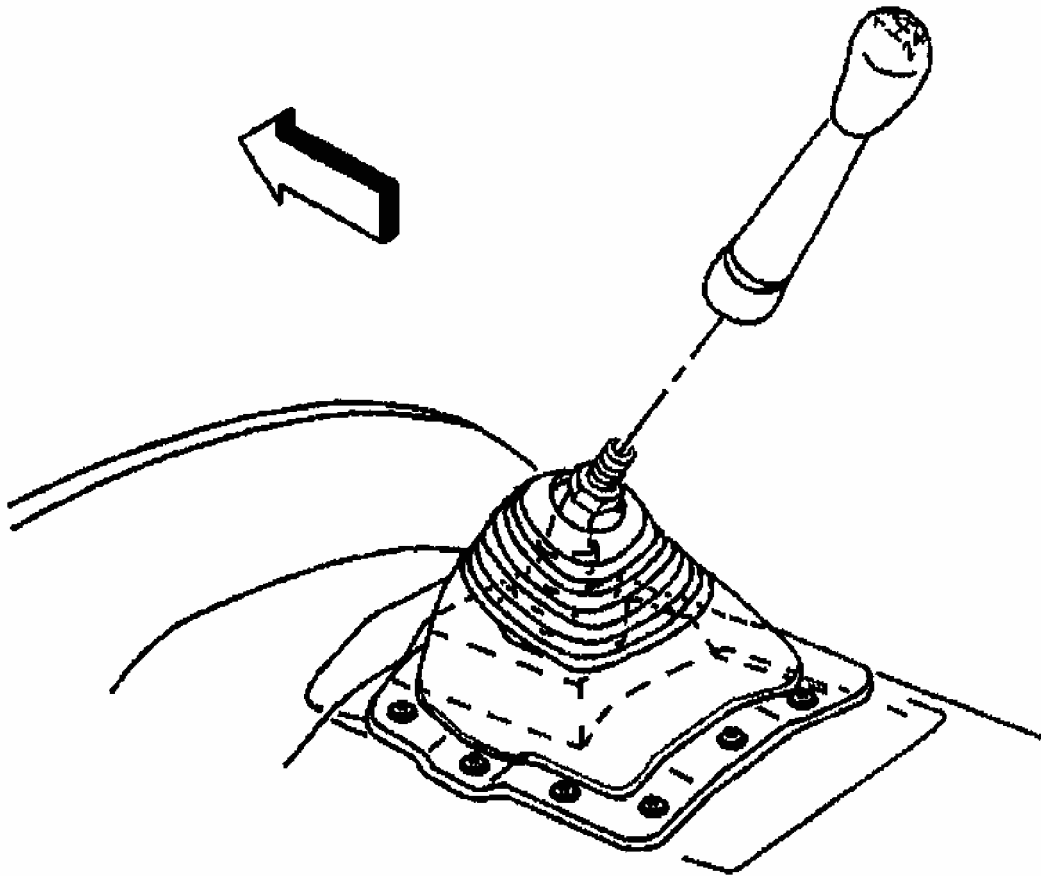
The transmission must remain in this state when the shift housing is removed.

- Do not disassemble the transmission shift housing. Internal parts for this shift housing are not available.

Opening the shift housing voids the warranty.

- **When removing the shift housing from the transmission, use the exposed bolts on the base of the housing.**
- **If equipped, remove the 3 console nuts and console.**

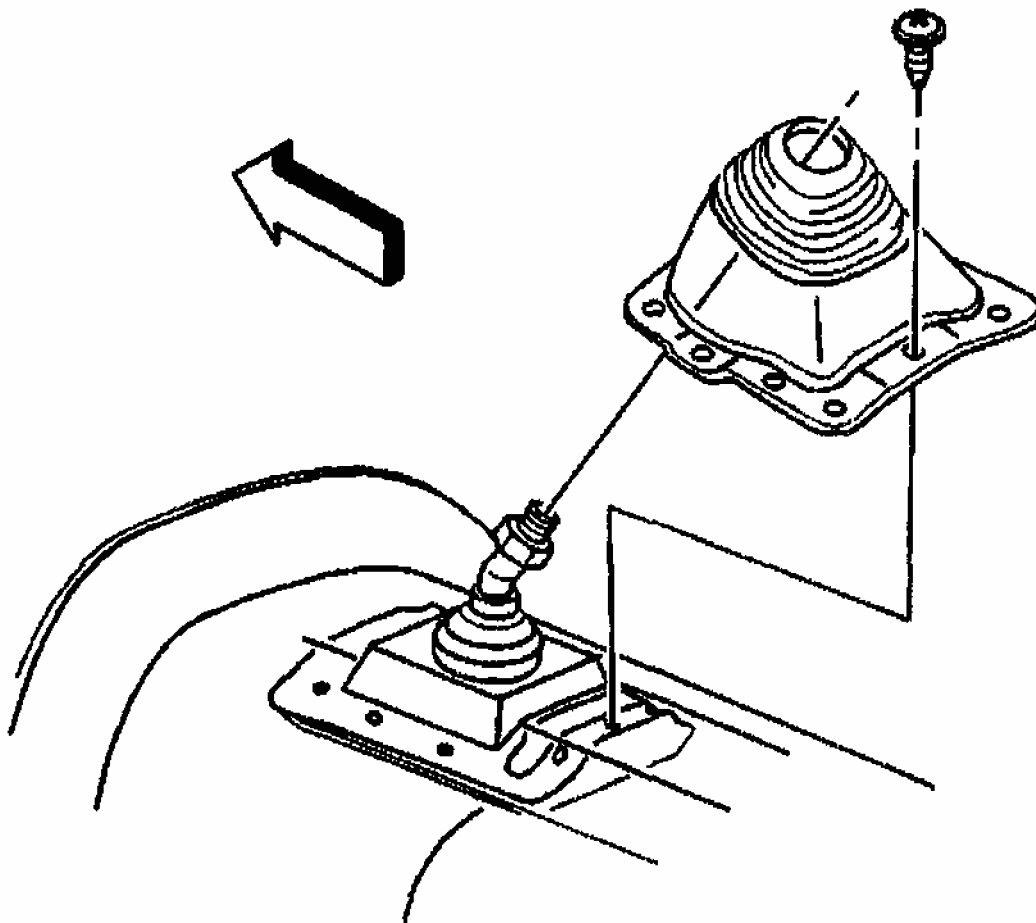
1. Remove the shift lever from the shift tower.



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Fig. 23: Removing Shift Lever From Shift Tower

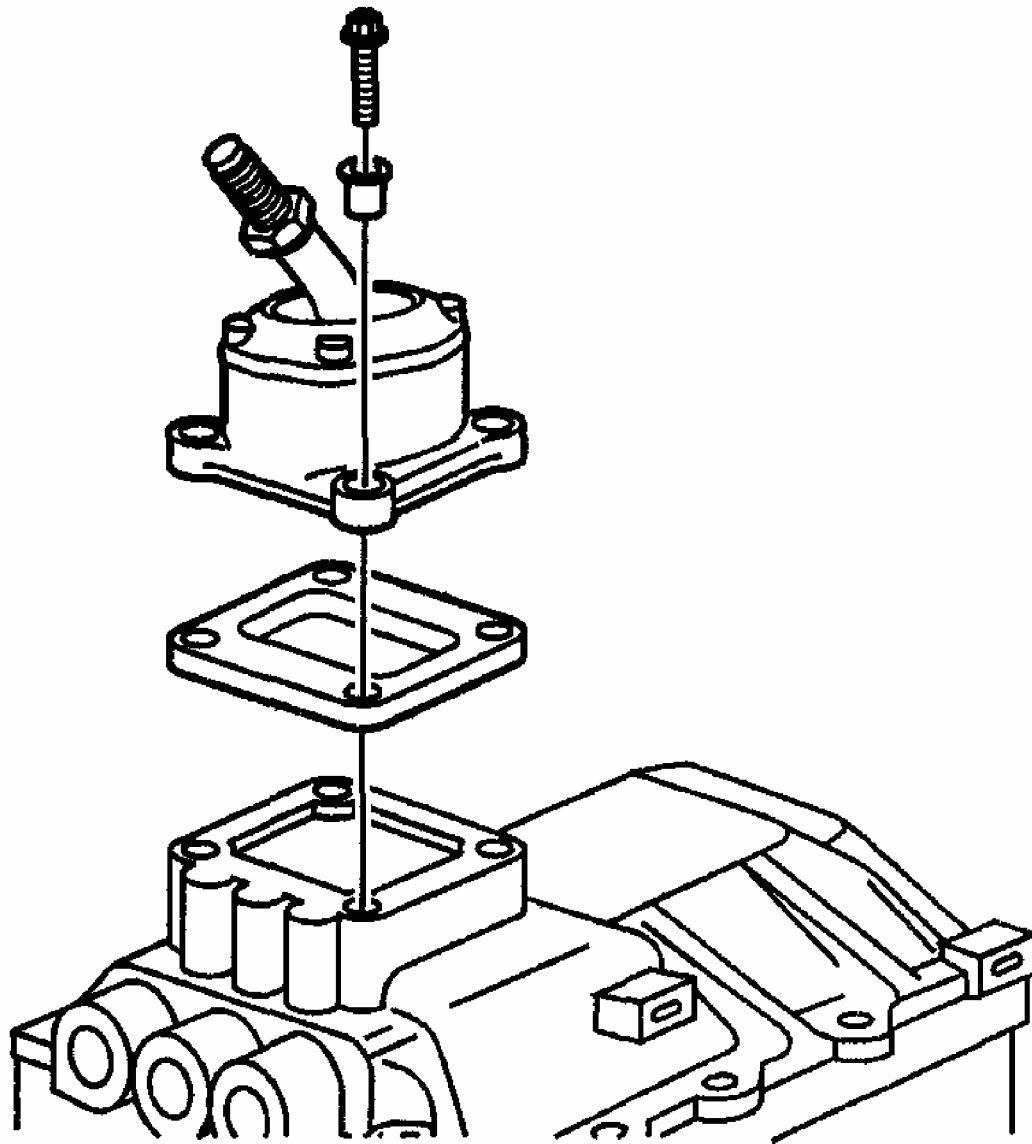
2. Pull back the carpet to access the screws.
3. Remove the screws securing the boot to the panel.



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Fig. 24: Removing Screws Securing Boot To Panel

4. Remove the 4 bolts securing the shift housing to the transmission.



G01840429

Fig. 25: Removing Bolts Securing Shift Housing To Transmission

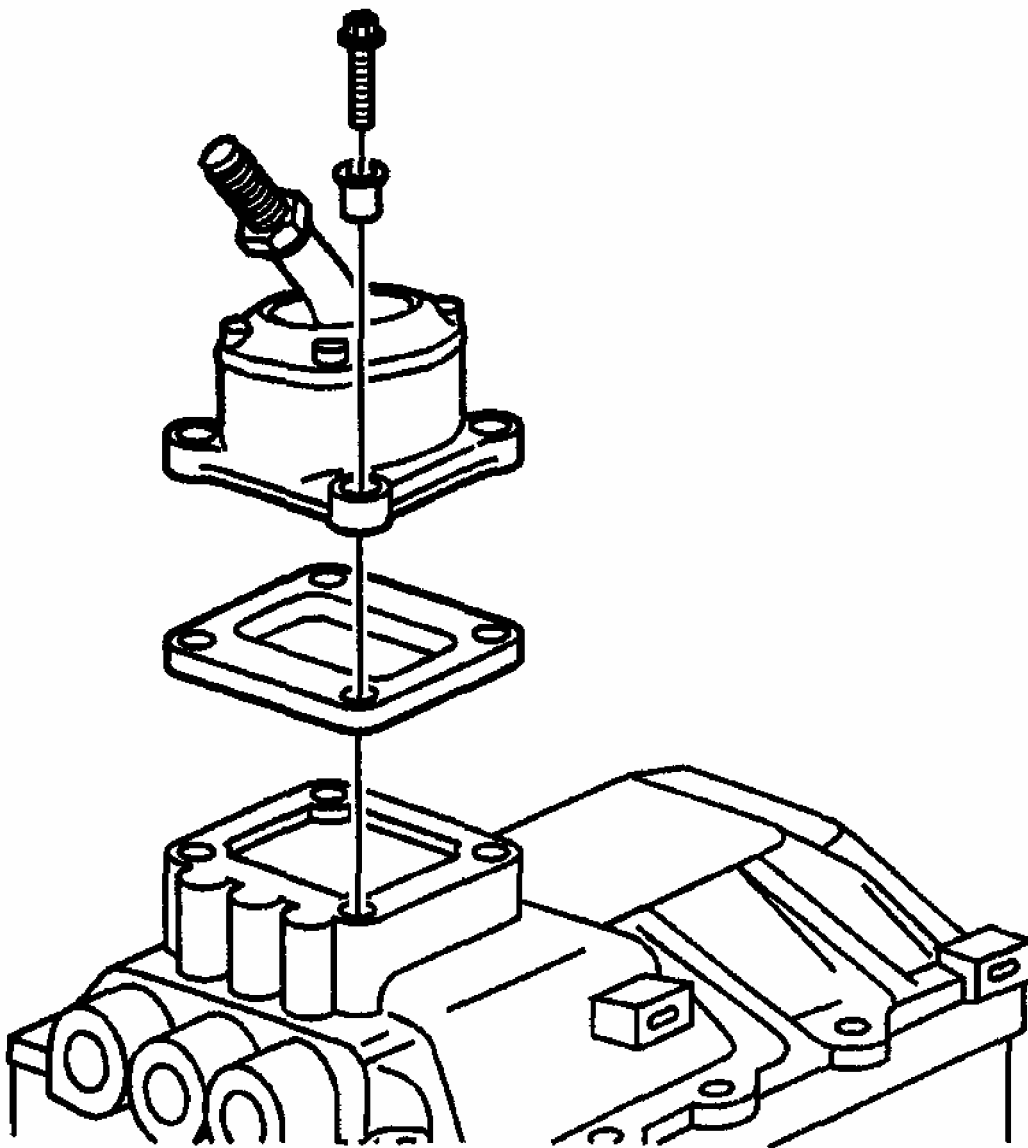
5. Remove the shift housing.

Installation Procedure

1. Install the shift housing to the transmission case.

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that

application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.



G01840430

Fig. 26: Installing Shift Housing-To-Transmission Bolts

2. Install the 4 bolts securing the shift housing to the transmission.

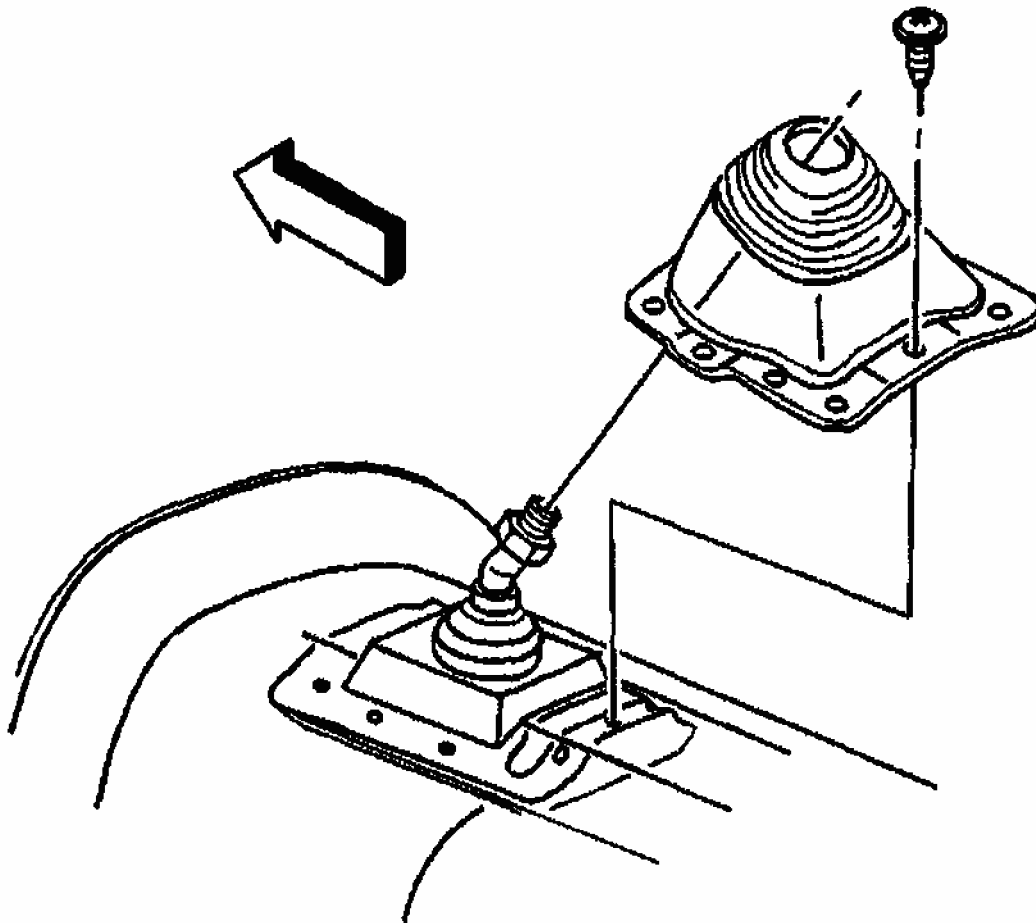
Tighten

Tighten the shift housing bolts to 20 N.m (15 lb ft).

3. Install the screws securing the boot to the panel.

Tighten

Tighten the screws to 2 N.m (18 lb in).



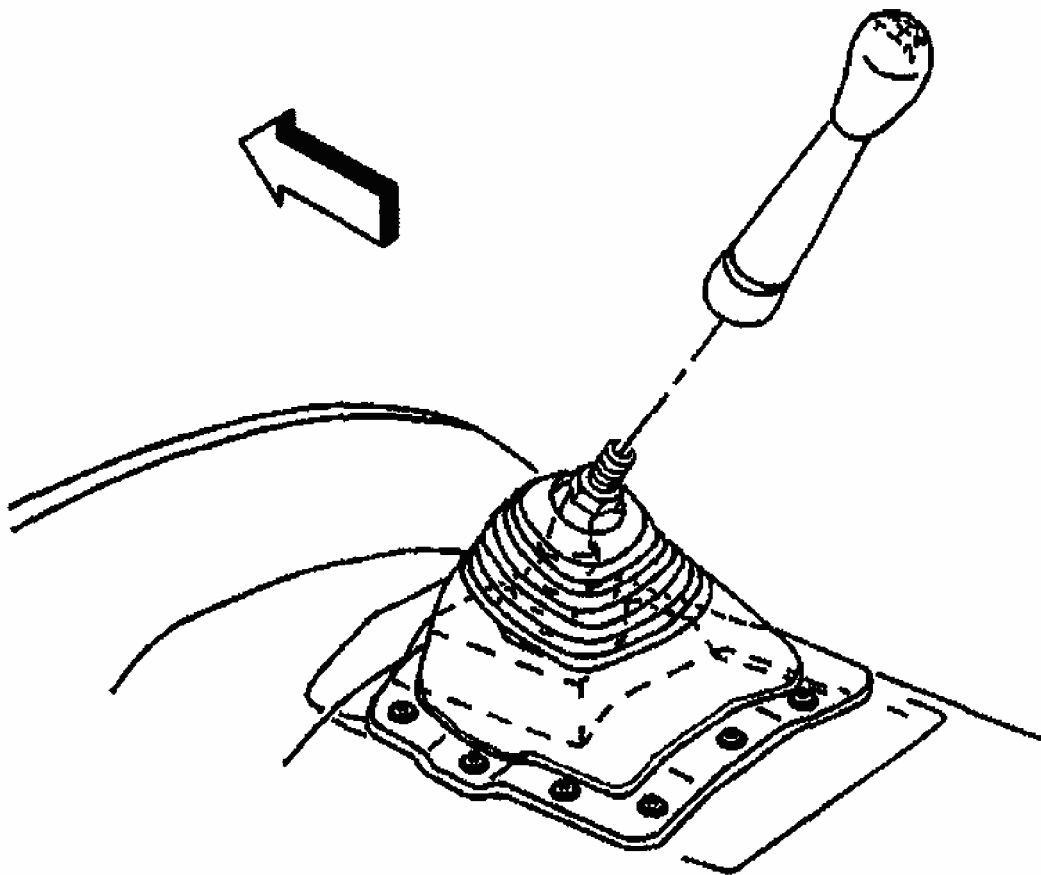
G01840431

Fig. 27: Installing Boot-To-Panel Screws

4. Install the shift lever to the Shift tower housing.
5. Install the console and the 3 console nuts (If equipped).

Tighten

Tighten the nuts to 2 N.m (18 lb in).



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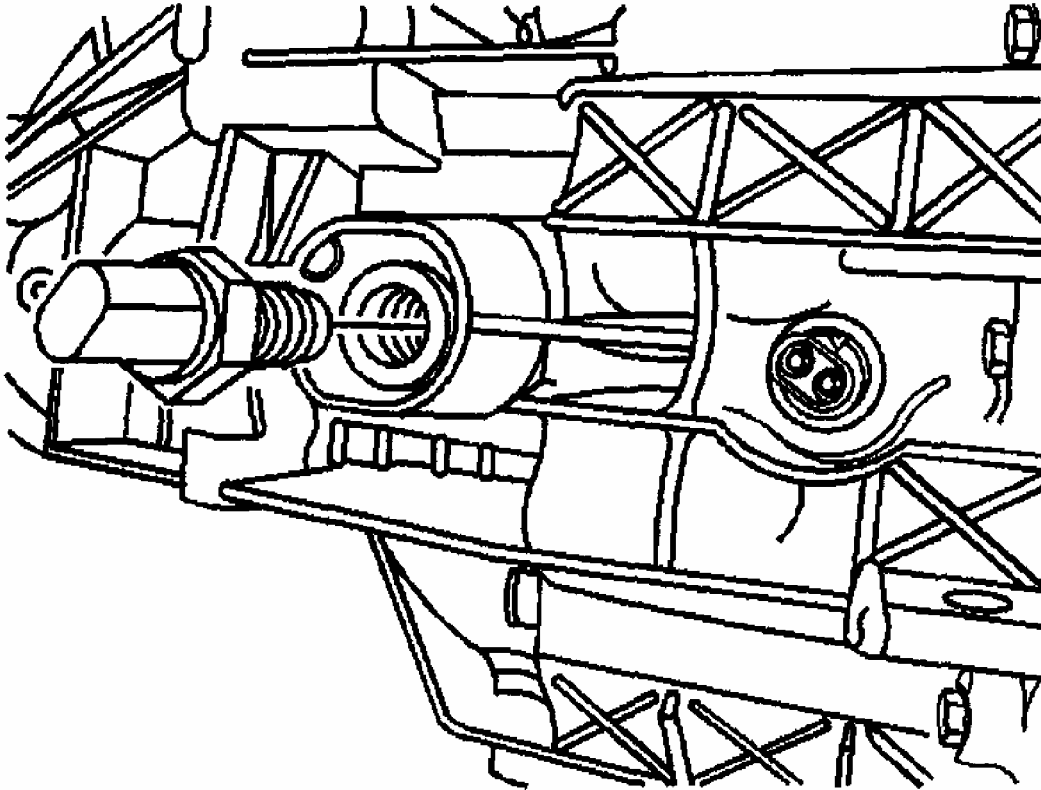
Fig. 28: Installing Console & Console Nuts

VEHICLE SPEED SENSOR (VSS) REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting & Jacking The Vehicle in General Information.
2. Disconnect the vehicle speed sensor electrical connector.
3. Remove the following parts:

- The vehicle speed sensor
- The O-ring seal



G01840433

Fig. 29: Removing Vehicle Speed Sensor

Installation Procedure

1. Coat a new O-ring seal with a thin film of transmission fluid.

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid

damage to parts and systems.

2. Install the following parts:

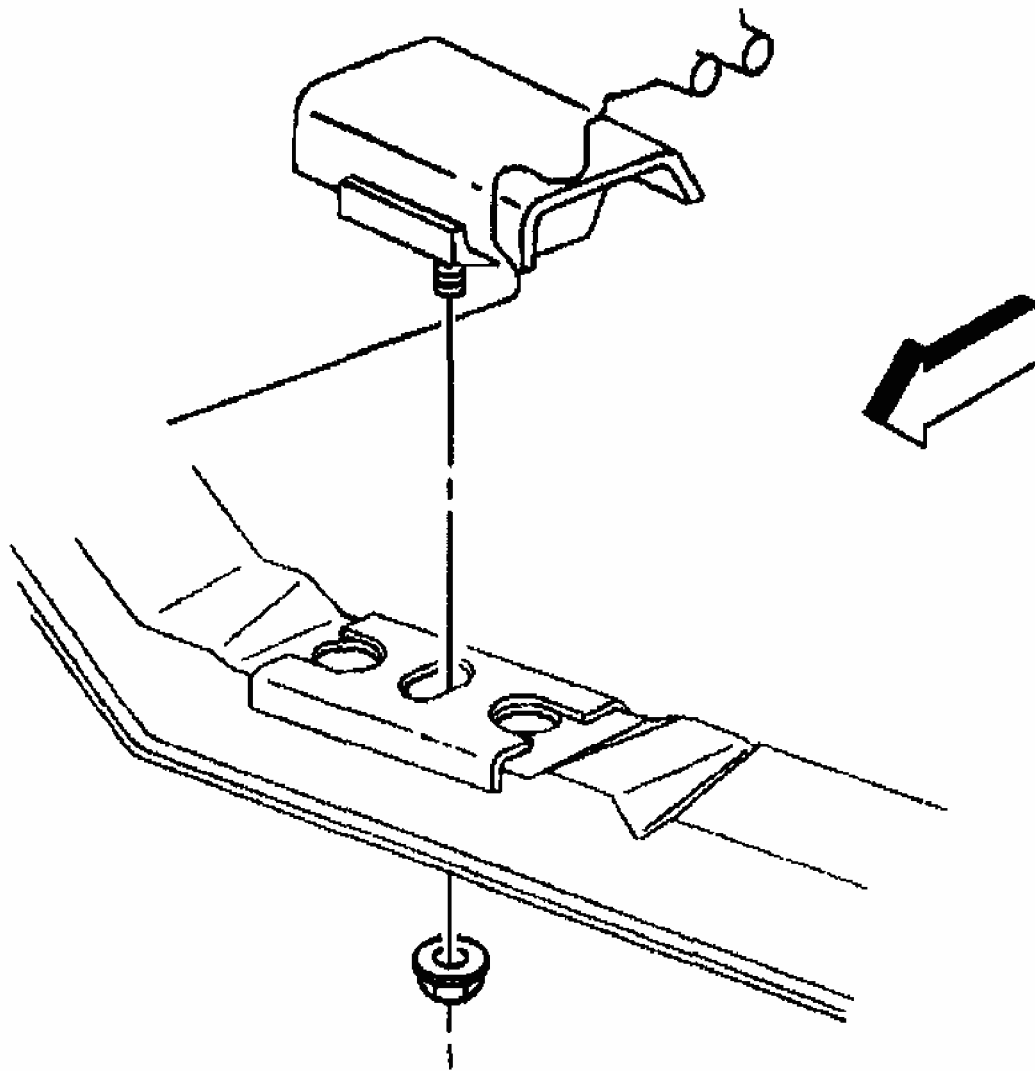
- The O-ring seal on the vehicle speed sensor
- The vehicle speed sensor, tightening it to 16 N.m (12 lb ft)
- Install the electrical connector to the vehicle speed sensor.
- Lower the vehicle.

TRANSMISSION MOUNT REPLACEMENT

Removal Procedure

NOTE: Broken or deteriorated mounts can cause misalignment and destruction of certain drive train components. When a single mount breaks, the remaining mounts are subjected to abnormally high stresses.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Support the transmission with a transmission jack.
3. Remove the transmission mount to the transmission support retaining nut.



G01840435

Fig. 30: Removing Rear Engine Mount-To-Transmission Support Nut

4. Raise the transmission to take the weight off of the mount.
5. Remove the transmission mount to the transmission mounting bolts.

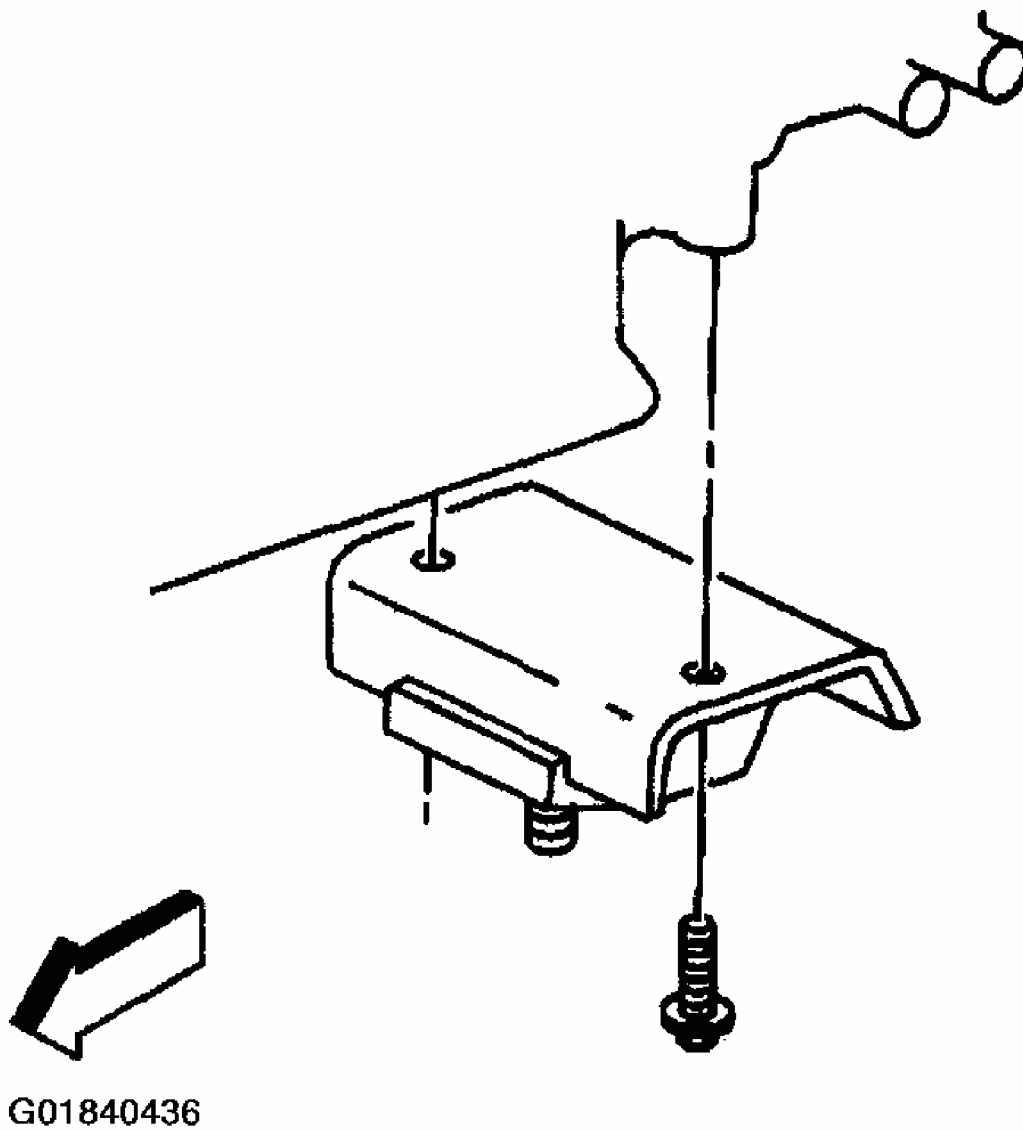


Fig. 31: Removing Mount-To-Transmission Bolts

6. Raise the transmission just enough to remove the transmission mount.
7. Remove the transmission mount from the vehicle.

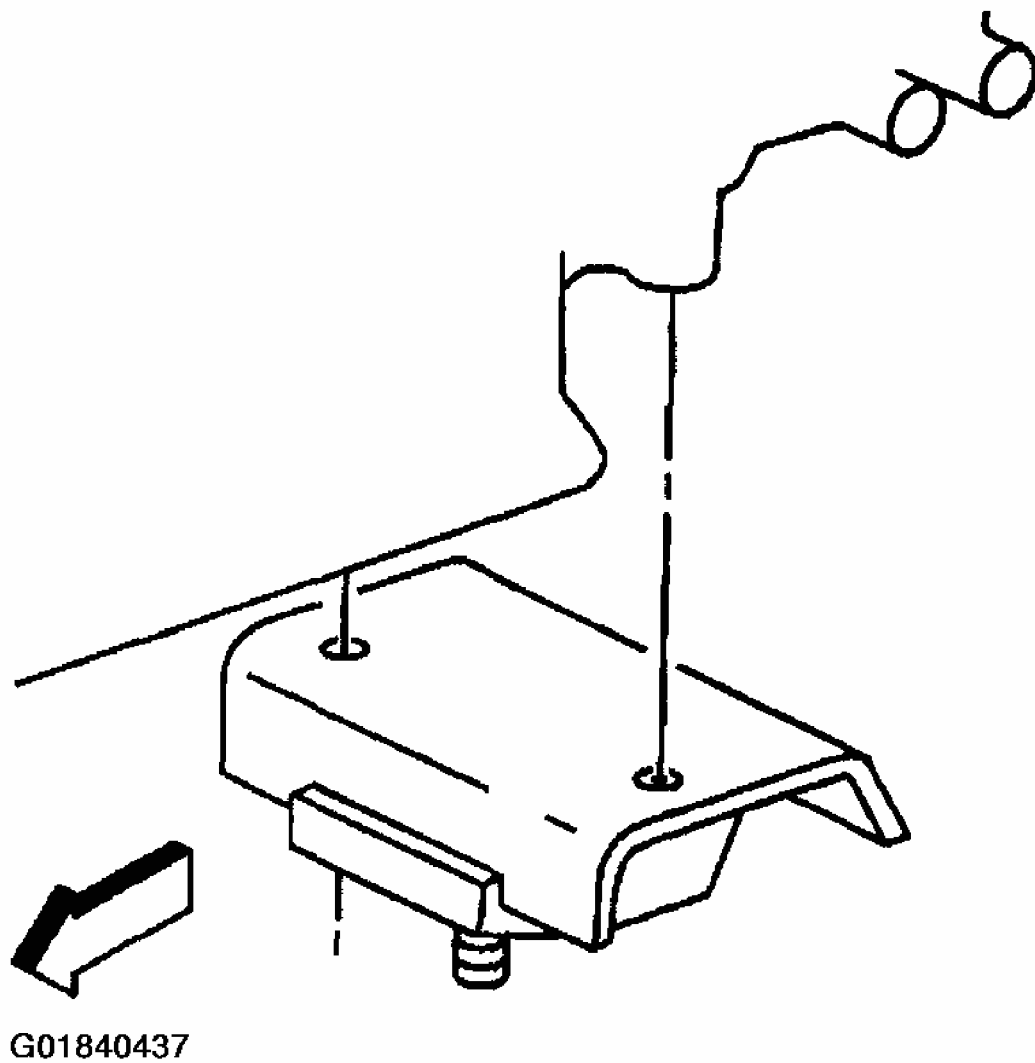


Fig. 32: Removing Transmission Mount

Installation Procedure

1. Install the transmission mount to the vehicle.

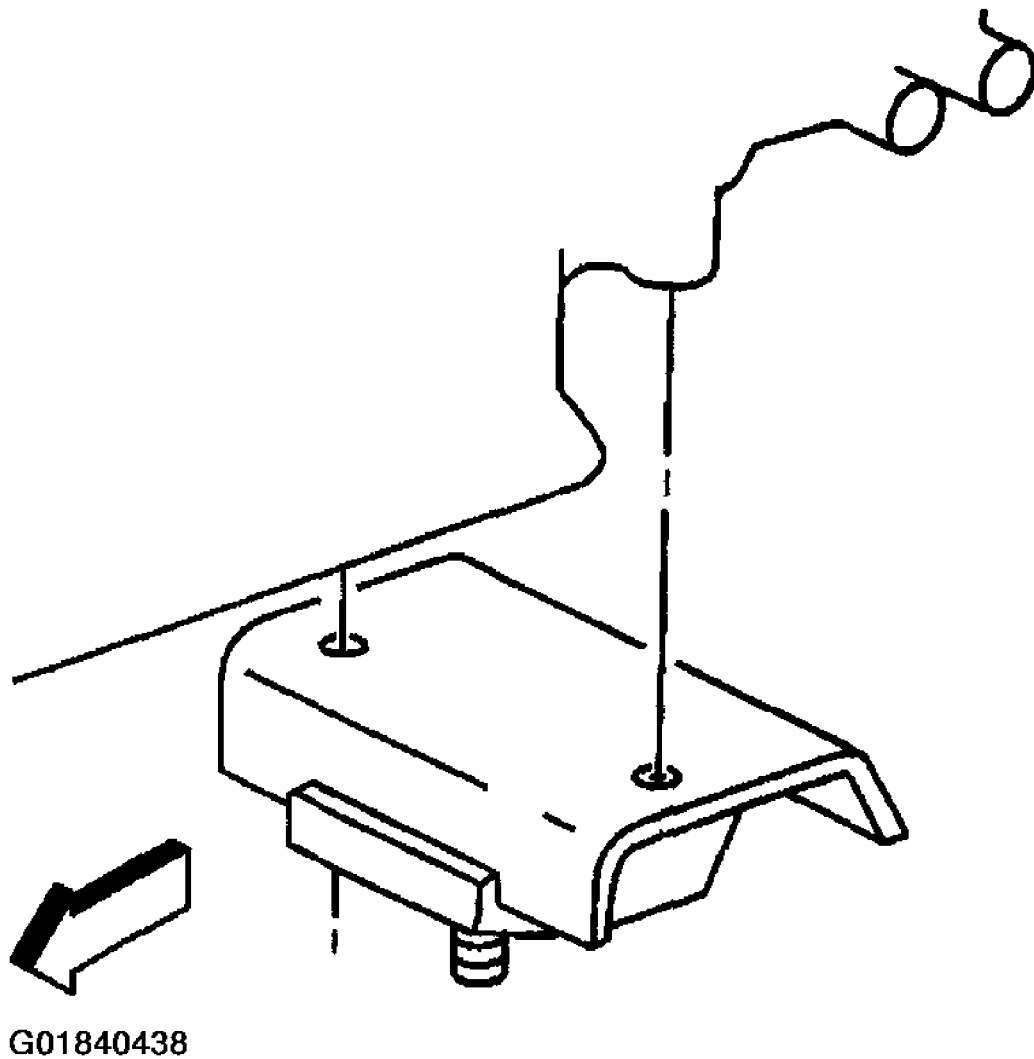


Fig. 33: Installing Transmission Mount

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

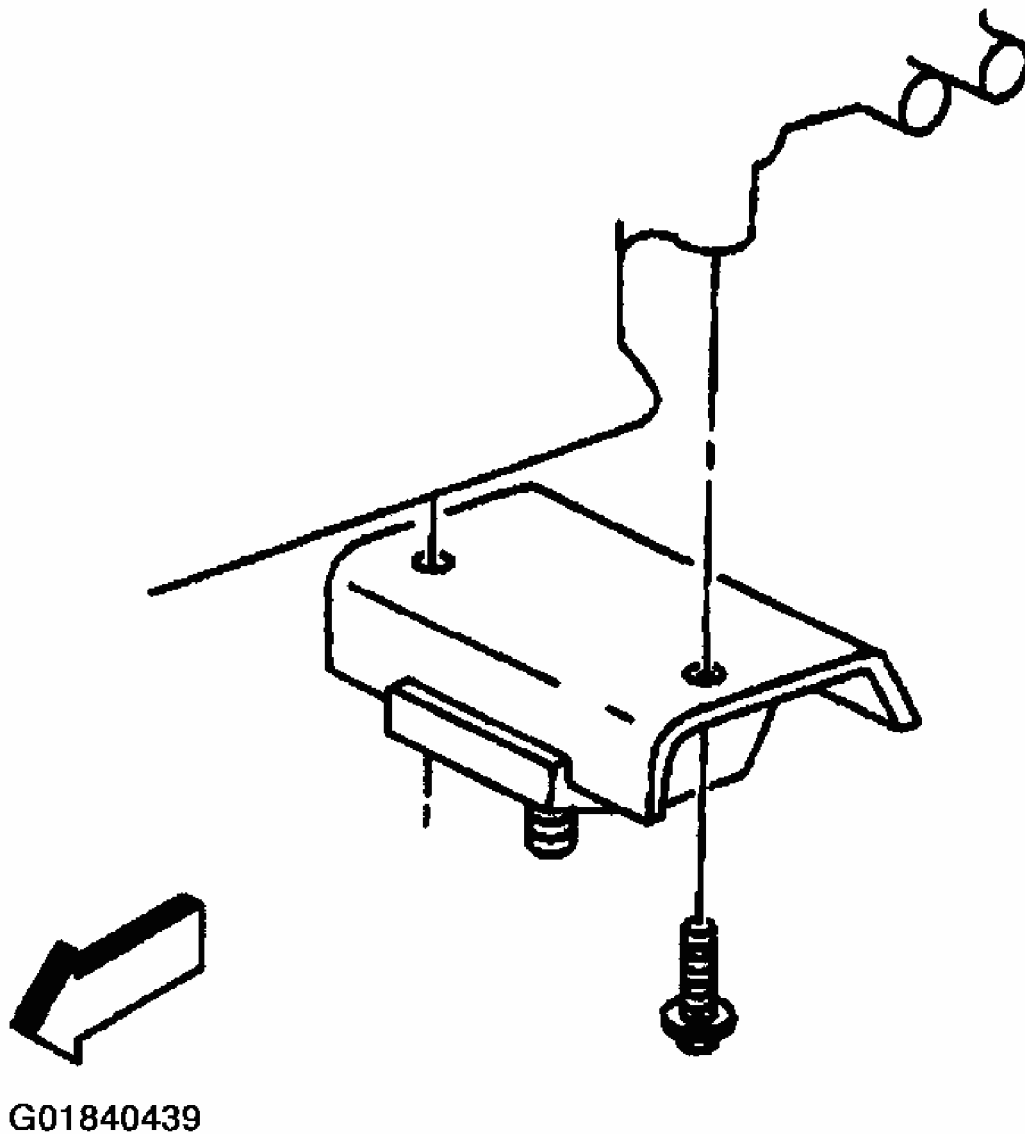


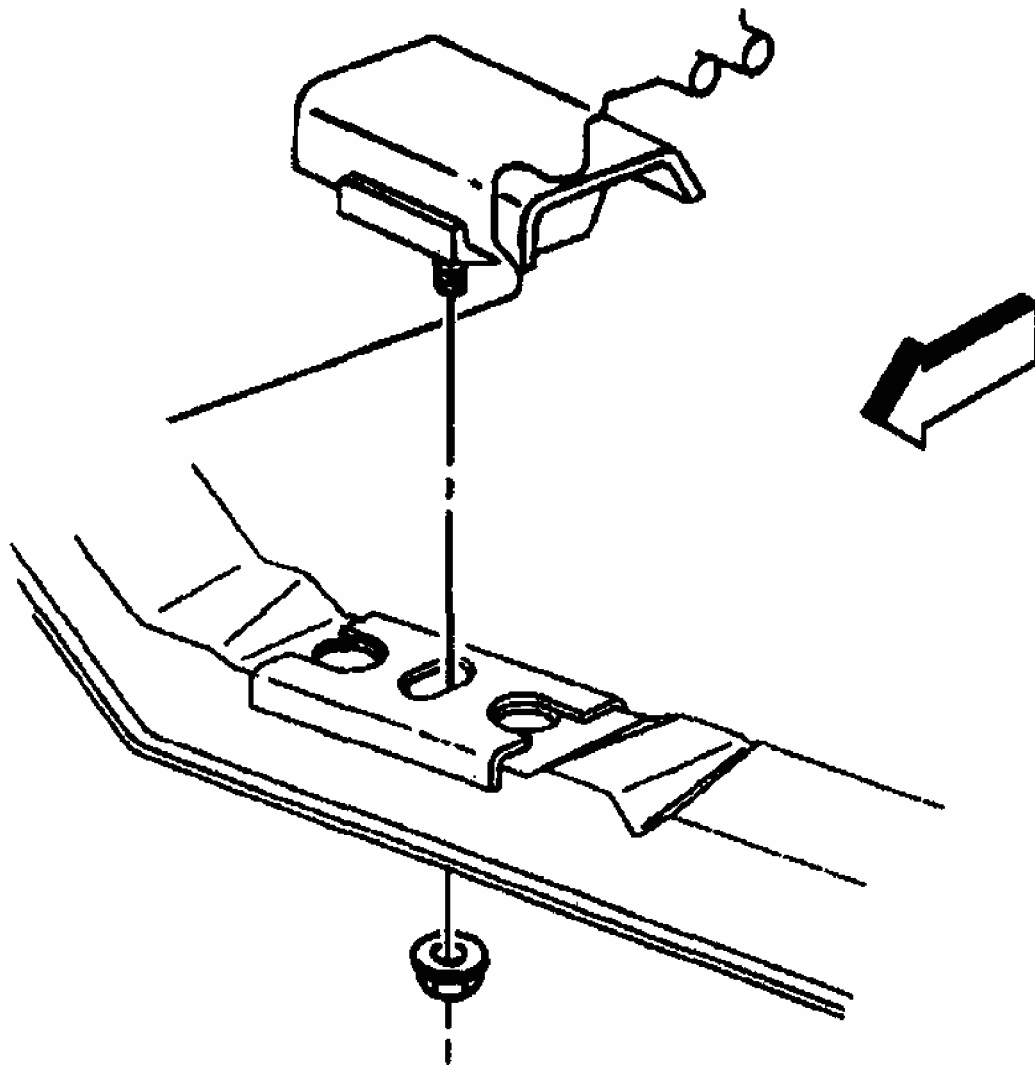
Fig. 34: Installing Mount-To-Transmission Bolts

2. Install the transmission mount to the transmission mounting bolts.

Tighten the transmission mount to transmission bolt to 45 N.m (33 lb ft).

3. Lower the transmission.
4. Install the transmission mount to the transmission support retaining nut.

Tighten the nut to 57 N.m (42 lb ft).



G01840440

Fig. 35: Installing Rear Engine Mount-To-Transmission Support Nut

5. Remove the transmission jack.
6. Lower the vehicle.

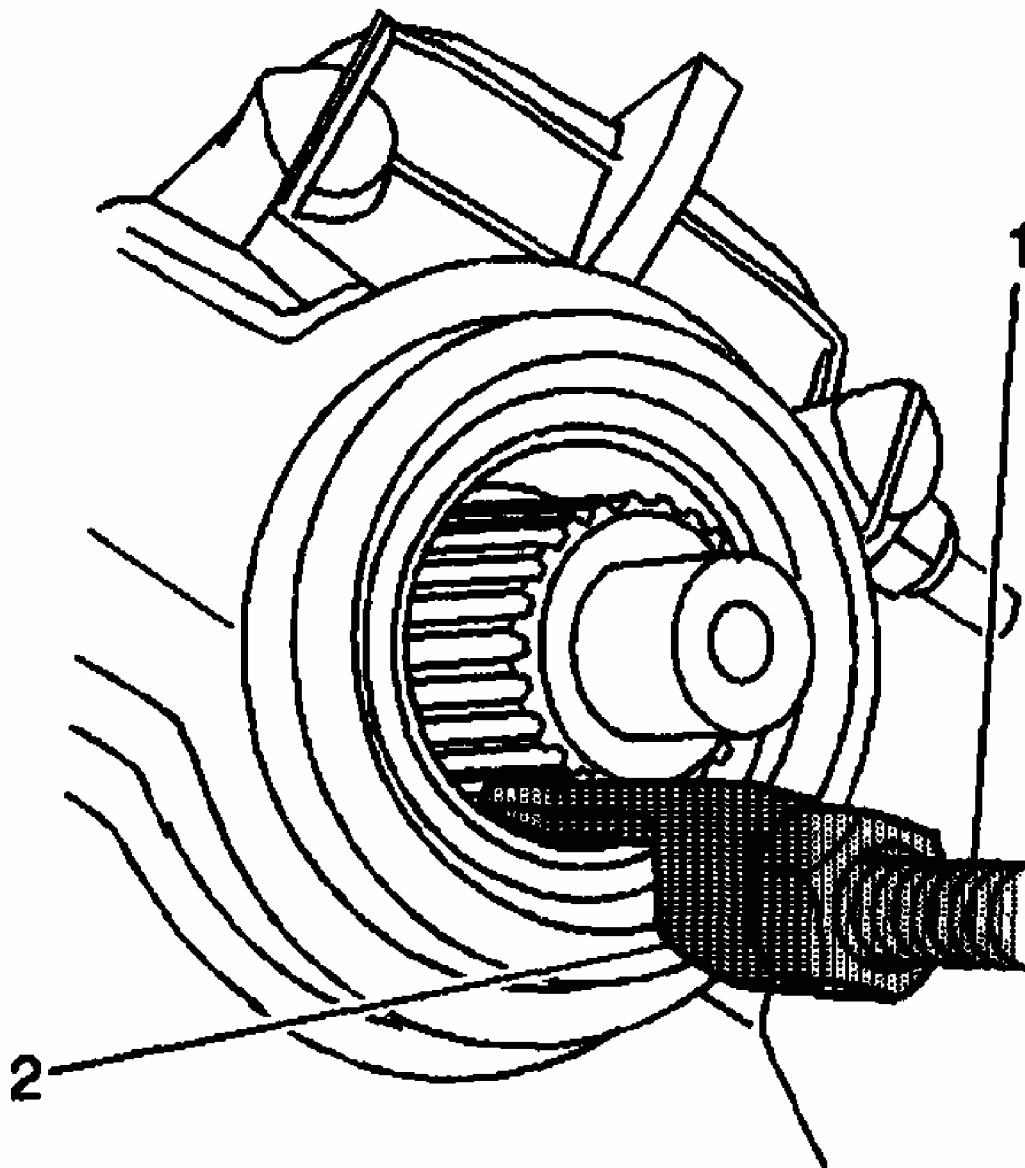
TRANSMISSION HOUSING OIL SEAL REPLACEMENT (REAR)

Tools Required

- *J 23129* Universal Seal Remover
- *J 6125-1B* Slide Hammer
- *J 36503* Seal Installer

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting & Jacking The Vehicle in General Information.
2. Remove the Rear Driveshaft .
3. Remove the rear oil seal from the rear case using the *J 6125-1B* (1) and the *J 23129* (2).



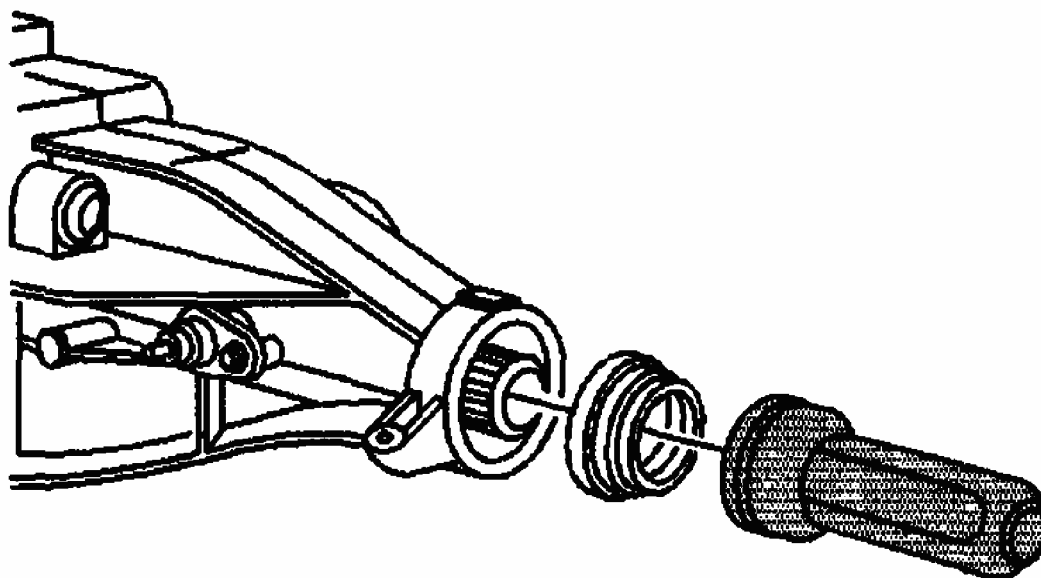
G01840441

Fig. 36: Removing Rear Case Rear Oil Seal

4. Remove the rear oil seal from the extension housing.

Installation Procedure

1. Using the *J 36503* install the new rear oil seal.



G01840442

Fig. 37: Installing NEW Rear Oil Seal

2. Install the Rear Driveshaft .
3. Fill the transmission to the proper fluid level. Refer to **TRANSMISSION FLUID REPLACEMENT** .
4. Lower the vehicle.

TRANSMISSION HOUSING OIL SEAL REPLACEMENT (FRONT)

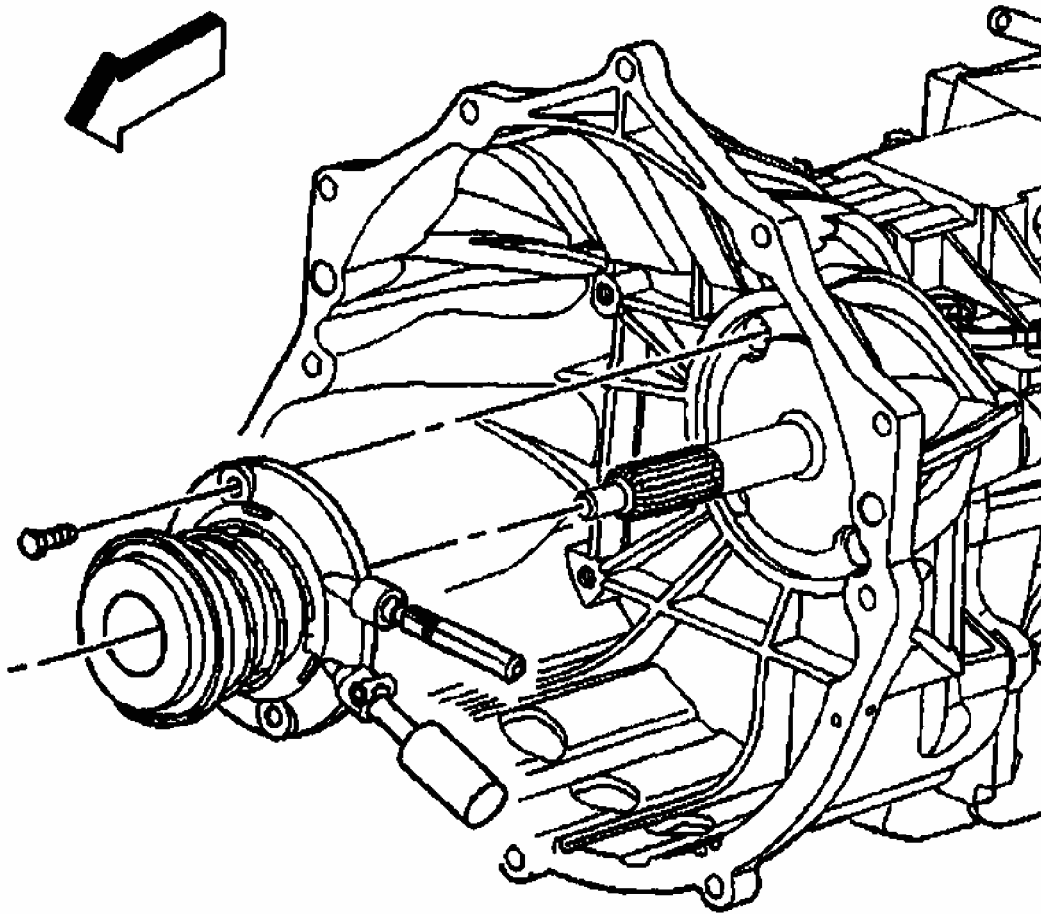
Tools Required

- *J 41371* Clutch Release Tool
- *J 38801* Input Shaft Seal Installer

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting & Jacking The Vehicle in General Information.
2. Remove the Rear Driveshaft .

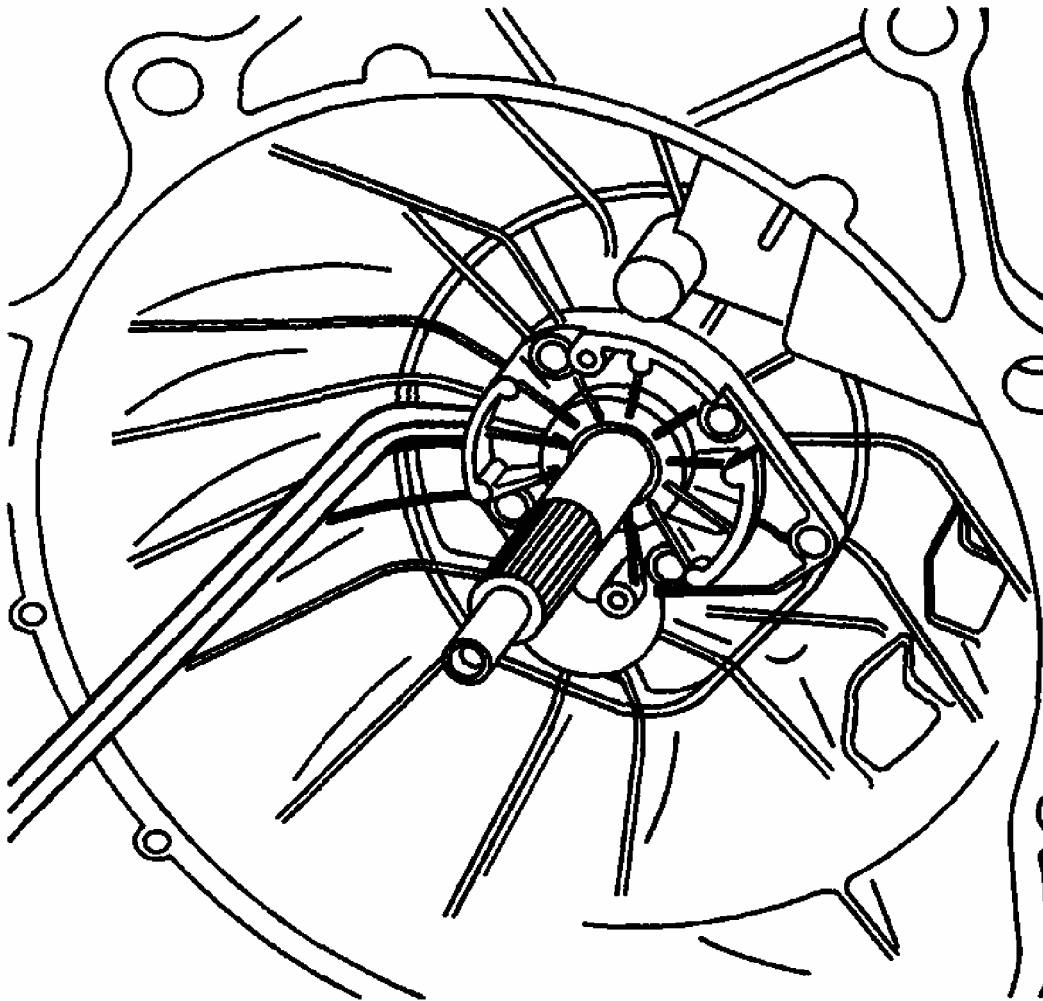
3. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT** .



G01840443

Fig. 38: Removing Clutch Actuator Bolts

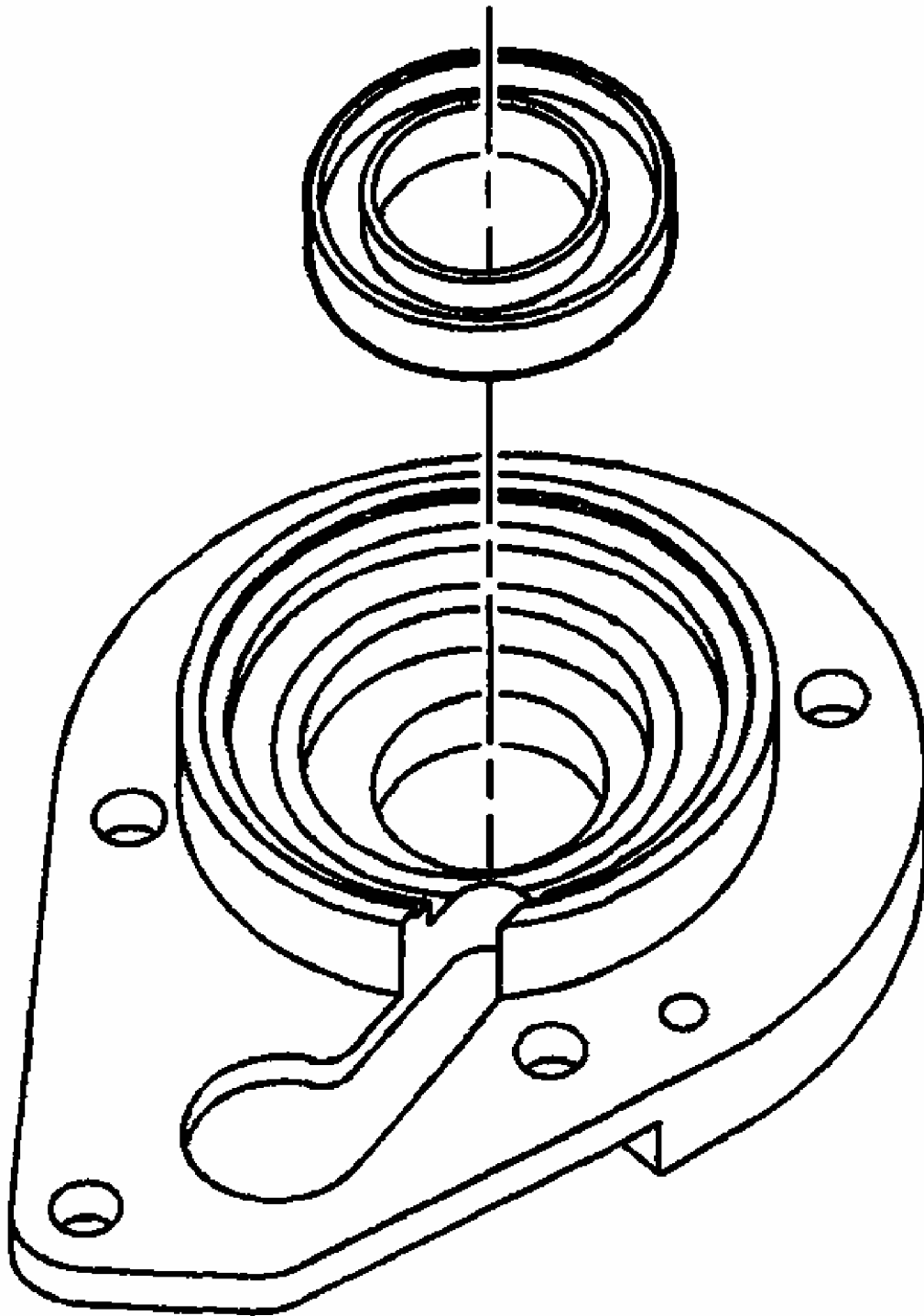
4. Remove the clutch actuator bolts.
5. Remove the clutch actuator from the input shaft.
6. Remove the 5 bolts from the front bearing retainer.
7. Use suitable prying tool to remove the input shaft bearing retainer.



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Fig. 39: Removing Input Shaft Bearing Retainer

8. Remove the input shaft retaining ring.
9. Remove the input shaft seal from the input shaft bearing retainer.



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Fig. 40: Removing Input Shaft Seal From Input Shaft Bearing Retainer

2001 Chevrolet S10 Pickup

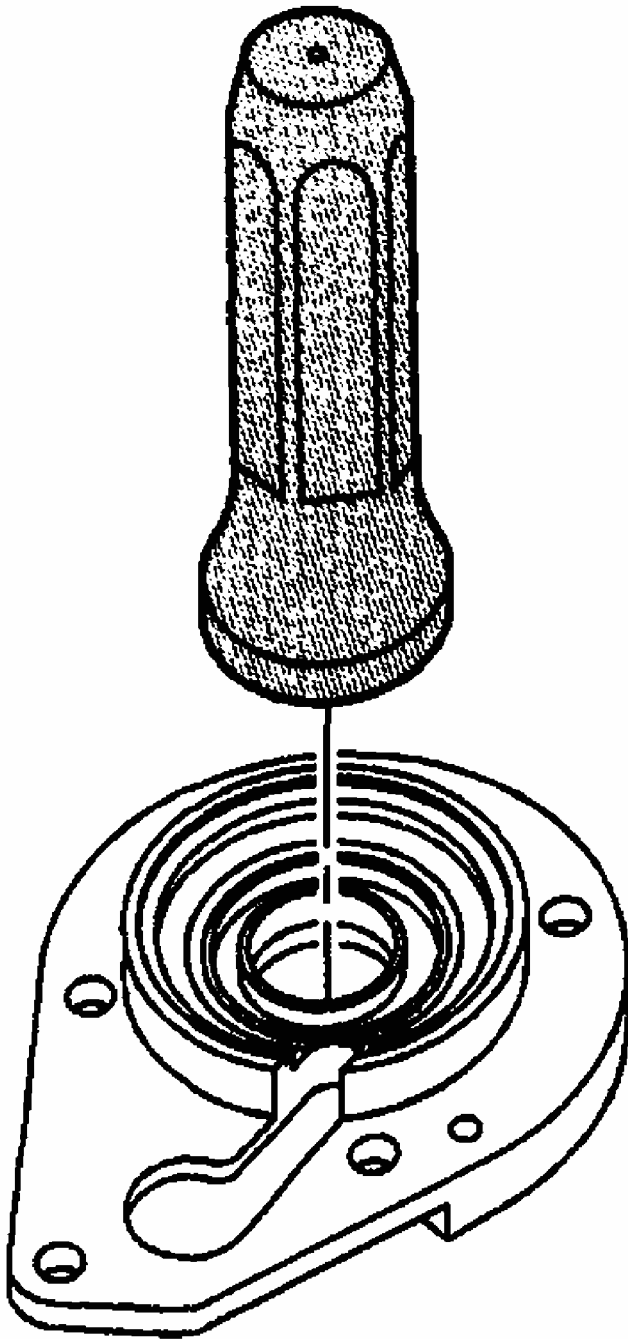
2001 MANUAL TRANSMISSIONS Manual Transmission - NV 1500 - Sonoma & S10 Pickup

10. Remove the old gasket material from the front bearing retainer.

Installation Procedure

IMPORTANT: Inspect the bearing retainer for any nicks or cracks that may result in a leak. Replace if necessary.

1. Install the retaining ring on the input shaft bearing. Place the input shaft seal in the front bearing retainer.
2. Using the *J 38801* install the input shaft seal.

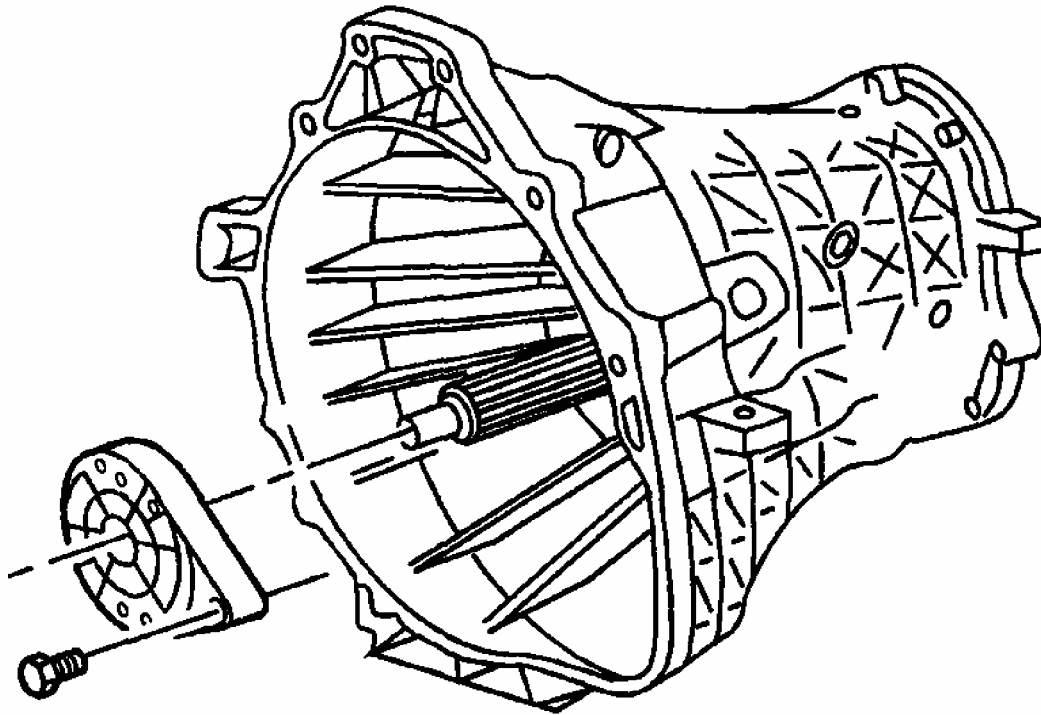


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Fig. 41: Installing Input Shaft Seal

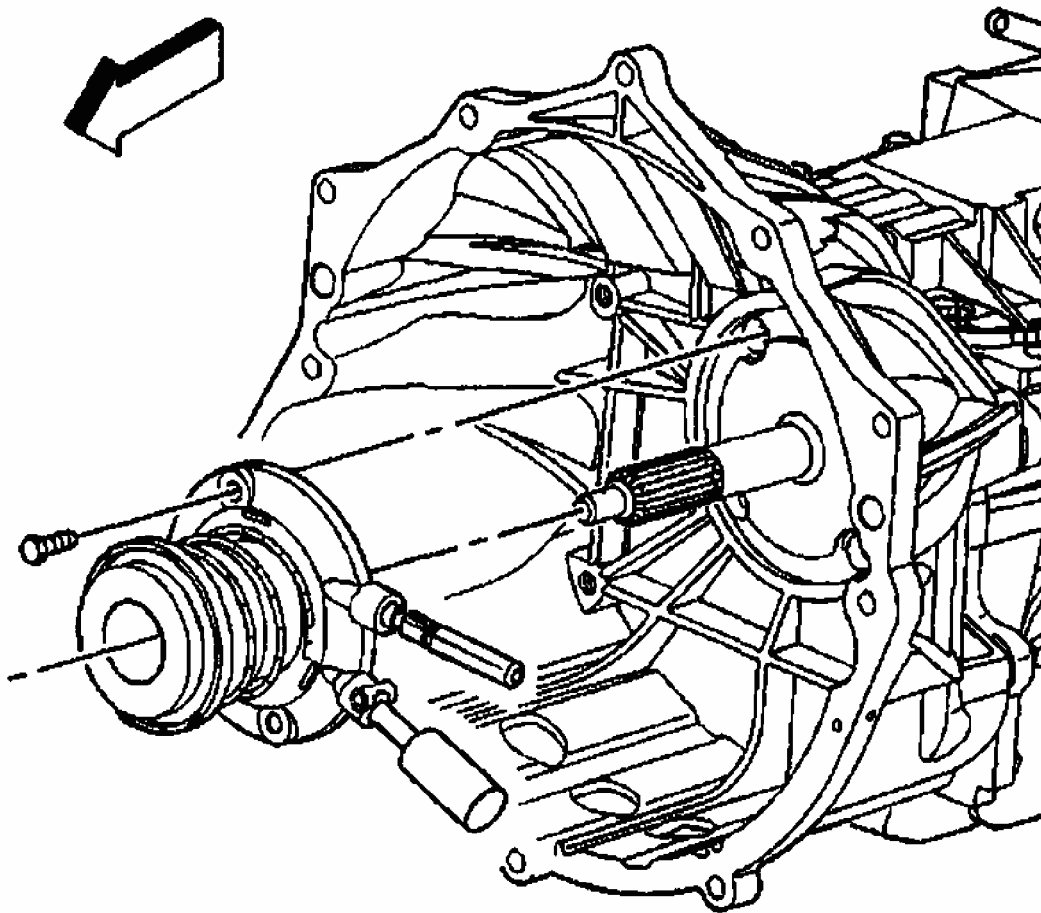
3. Apply a thin layer of RTV sealer GM P/N 12345739 or equivalent to the mating surfaces of the input shaft bearing retainer.
4. Install the input shaft bearing retainer to the clutch housing. Tighten the 5 bearing retainer bolts to 29 N.m (21 lb ft).

5. Install the clutch actuator and bolts. Tighten the clutch actuator bolts to 8 N.m (71 lb in).



G01840447

Fig. 42: Installing Input Shaft Bearing Retainer-To-Clutch Housing



G01840448

Fig. 43: Installing Clutch Actuator-To-Input Shaft

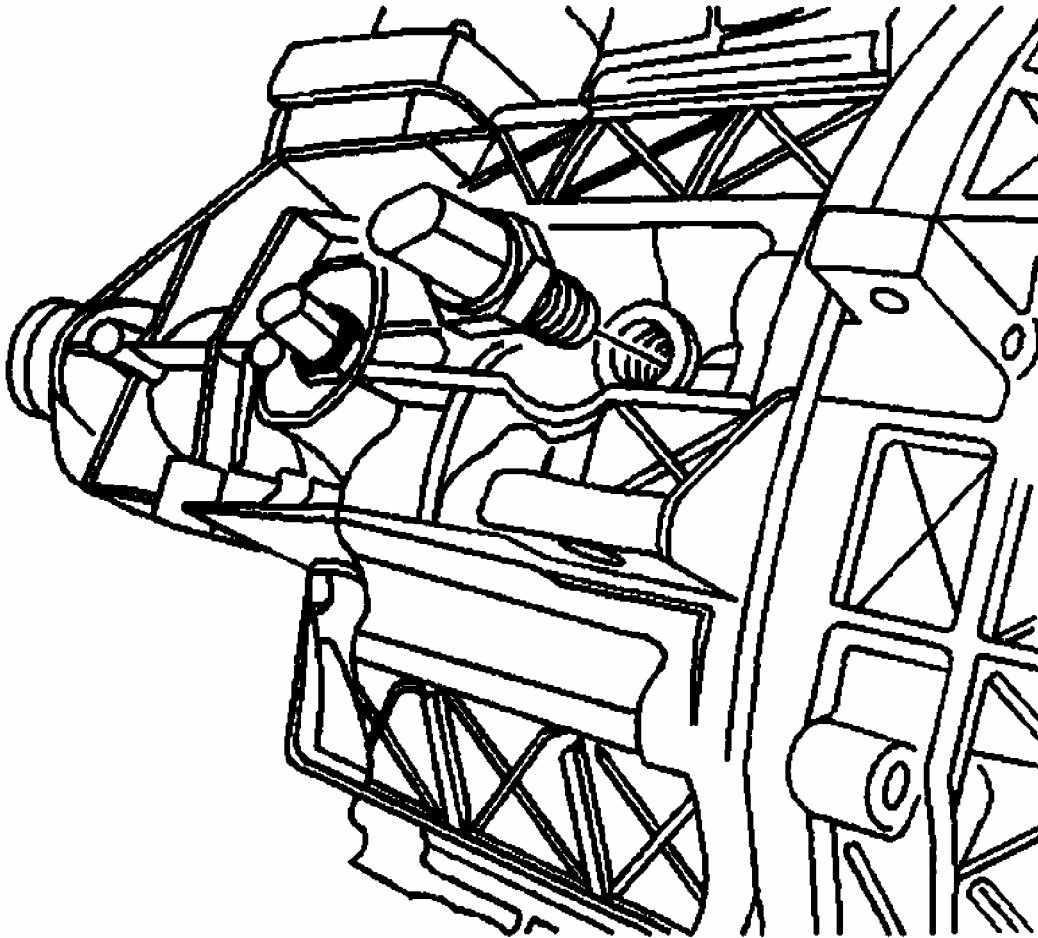
6. Install the transmission. Refer to **TRANSMISSION REPLACEMENT** .
7. Install the Rear Driveshaft .
8. Fill the transmission to the proper fluid level. Refer to **TRANSMISSION FLUID REPLACEMENT** .
9. Lower the vehicle.

BACKUP LAMP SWITCH REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting & Jacking The Vehicle in General Information.
2. Support the vehicle with safety stands.
3. Disconnect the backup lamp switch electrical connector.

4. Remove the backup lamp switch.



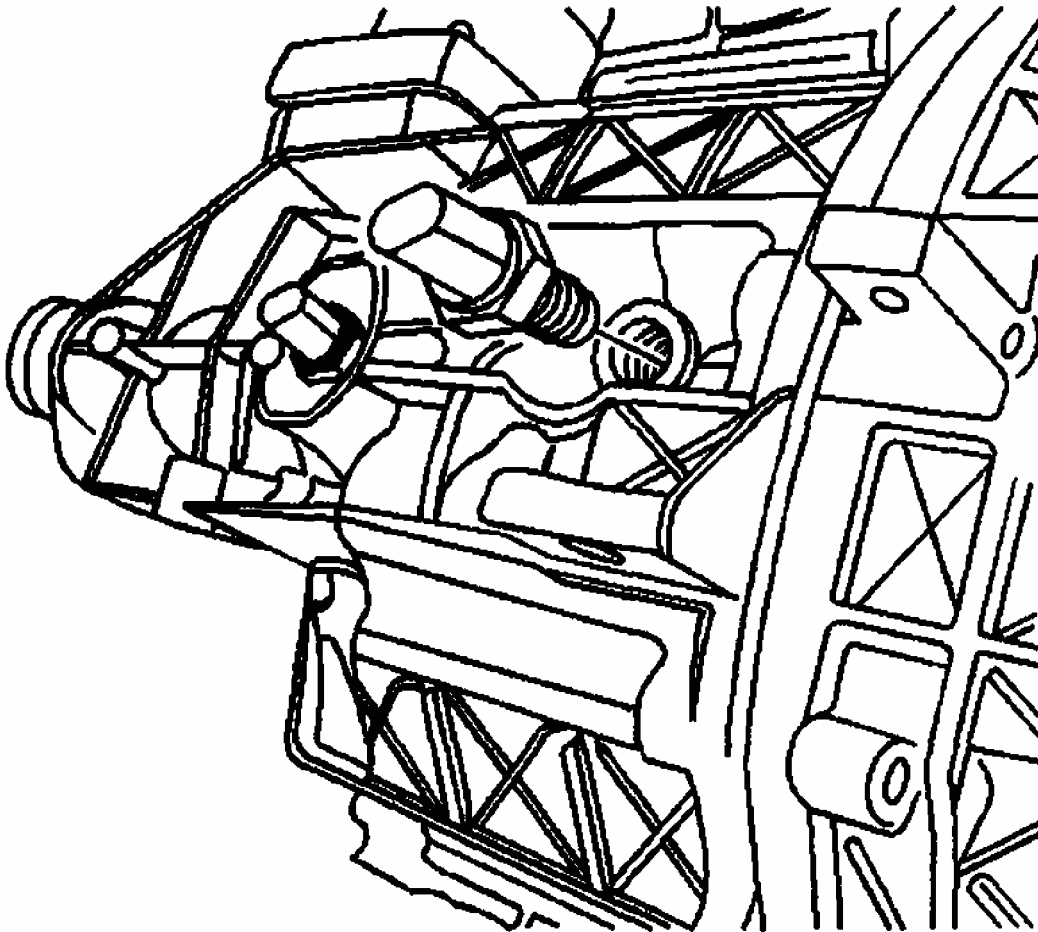
G01840449

Fig. 44: Removing Backup Lamp Switch

Installation Procedure

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid

damage to parts and systems.



G01840450

Fig. 45: Installing Backup Lamp Switch

1. Install the backup lamp switch.

The backup lamp switch has pre-applied thread sealant on the threads.

Tighten the backup lamp switch to 37 N.m (28 lb ft).

2. Connect the backup lamp switch electrical connector.
3. Lower the vehicle.

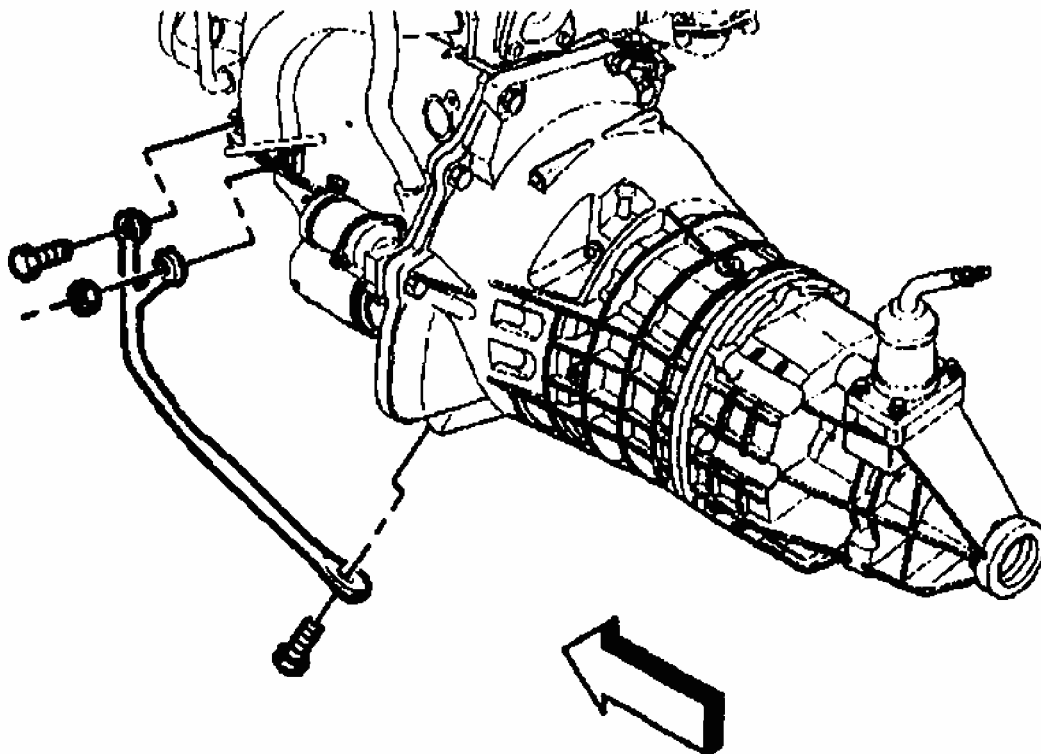
TRANSMISSION REPLACEMENT

Tools Required

J 42371 Clutch Line Removal Tool

Removal Procedure

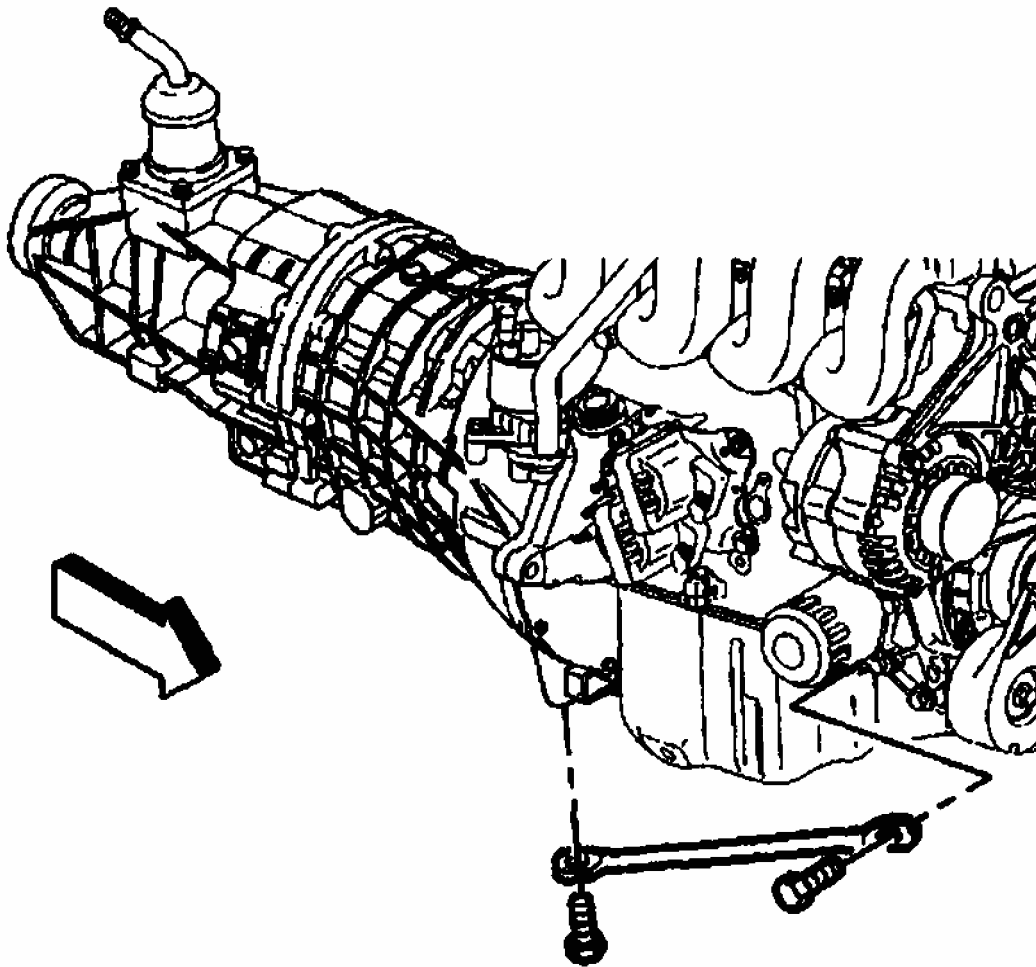
1. Shift the transmission into 3rd or 4th mechanical gear position.
2. Remove the shift lever. Refer to **SHIFT LEVER REPLACEMENT** .
3. Raise and support the vehicle. Refer to Lifting & Jacking The Vehicle in General Information.
4. Drain the transmission fluid into a suitable container.
5. Remove the Rear Driveshaft .
6. Remove the exhaust manifold pipe.
7. Remove the left side transmission to engine brace bolts and nut.



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Fig. 46: Removing Left Side Transmission-To-Engine Brace

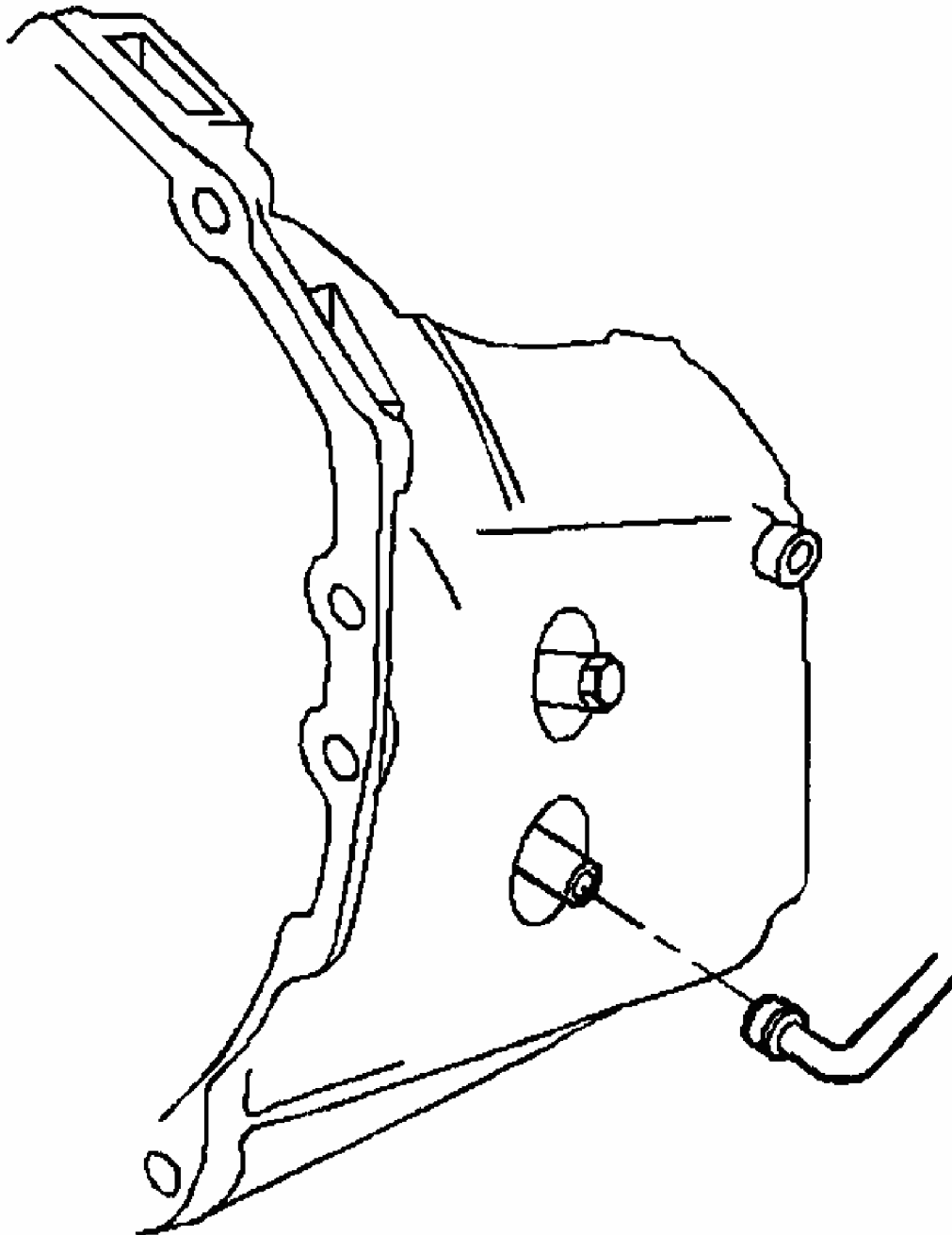
8. Remove the right side transmission to engine brace bolts.



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Fig. 47: Removing Right Side Transmission-To-Engine Brace

9. Use the *J 42371* , push back on the white plastic sleeve on the quick connect in order to separate the hydraulic clutch line from the concentric slave cylinder quick connect.

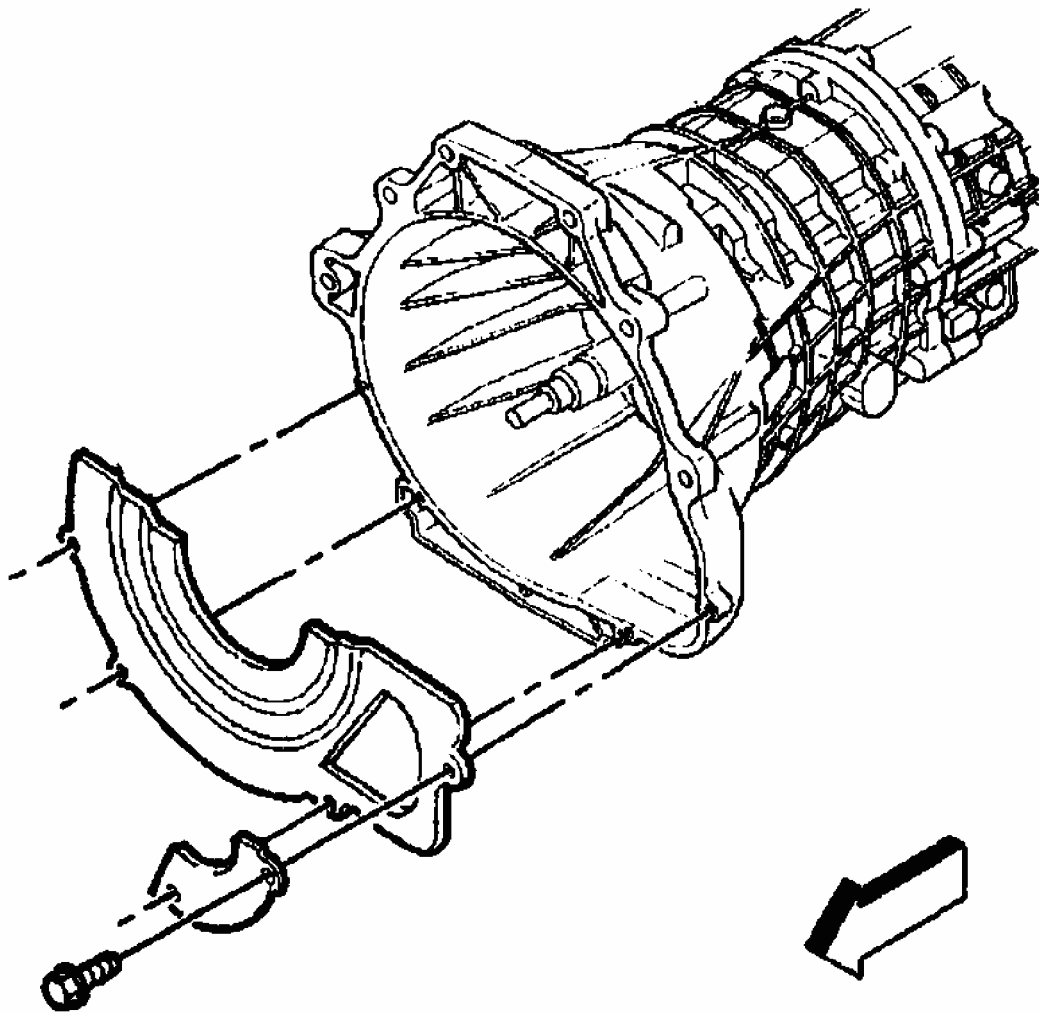


G01840453

Fig. 48: Separating Concentric Slave Cylinder Hydraulic Clutch Line Quick Connect

10. Disconnect the vehicle speed sensor & back up lamp switch electrical connectors. Remove the wiring harness from the harness retainers.

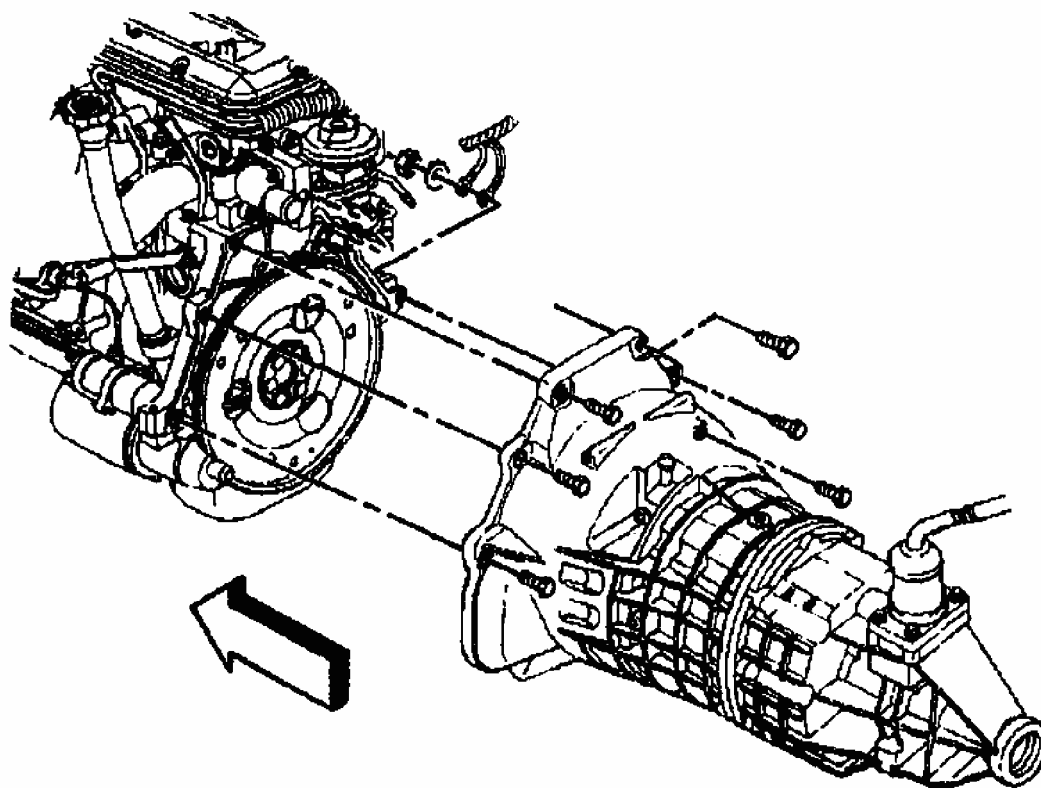
11. Remove the clutch housing cover bolts.



G01840454

Fig. 49: Removing Clutch Housing Cover

12. Remove transmission rear mount. See **TRANSMISSION MOUNT REPLACEMENT**.
13. Support the transmission with a transmission jack.
14. Remove the bolts securing the transmission to the engine.



G01840455

Fig. 50: Locating Transmission-To-Engine Bolts

15. Pull the transmission straight back on the clutch hub splines. Do not let the transmission hang from the clutch plate and the clutch cover.
16. Remove the transmission from the vehicle.
17. Remove the clutch plate and the clutch cover from the engine flywheel if required. See **CLUTCH ASSEMBLY & PILOT BEARING**.
18. If required, remove the insulator from the vehicle.

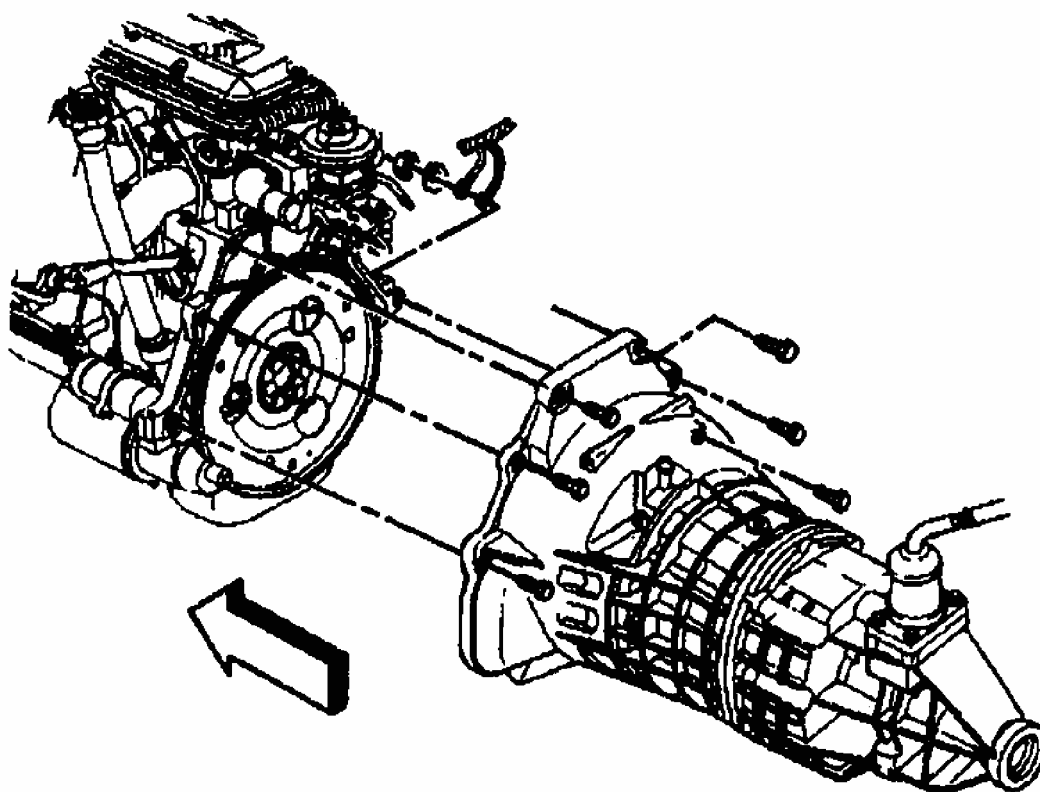
Installation Procedure

1. Install the clutch plate and the clutch cover to the engine flywheel if removed. See **CLUTCH ASSEMBLY & PILOT BEARING**.
2. If removed, install the insulator to the vehicle.

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are

identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

3. Install the transmission to the engine.
 - A. Ensure the transmission is positioned in the 3rd or 4th speed gear.
 - B. Rotate the transmission clockwise onto the clutch hub splines.
 - C. Install the bolts securing the transmission to the engine. Tighten the bolts to 47 N.m (35 lb ft).



G01840456

Fig. 51: Locating Transmission-To-Engine Bolts

4. Install the clutch housing cover using the bolts. Tighten the bolts to 14 N.m (10 lb ft).

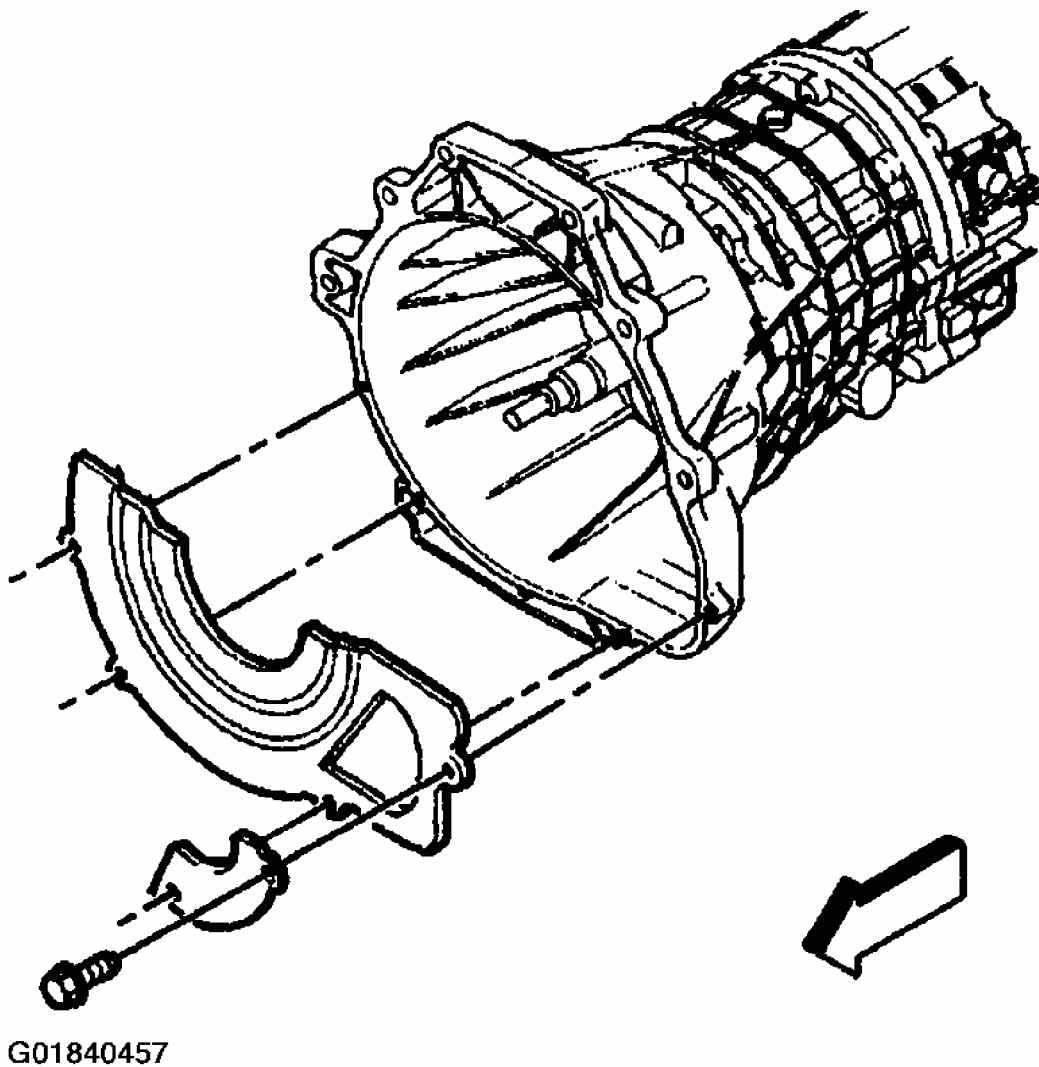
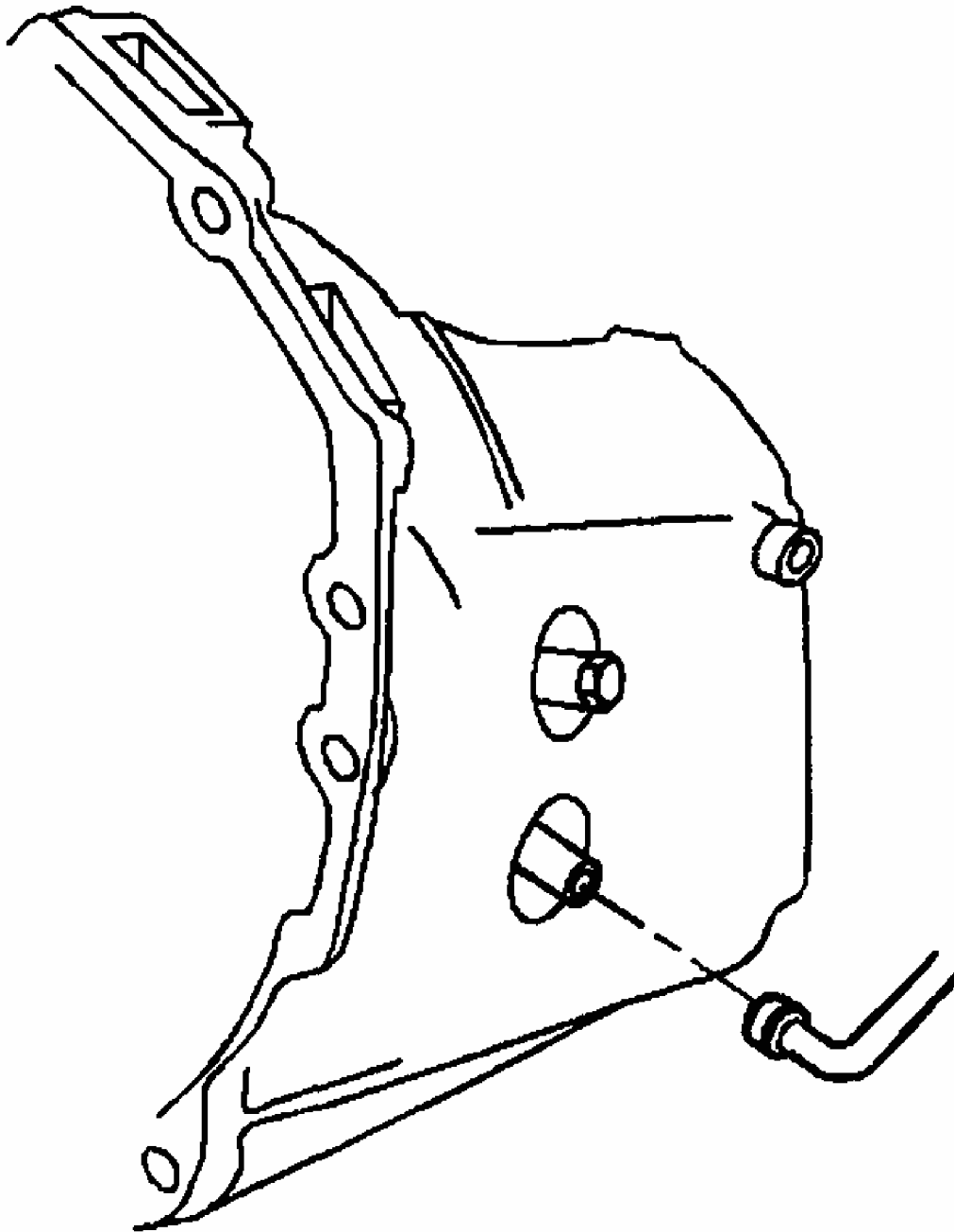


Fig. 52: Installing Clutch Housing Cover

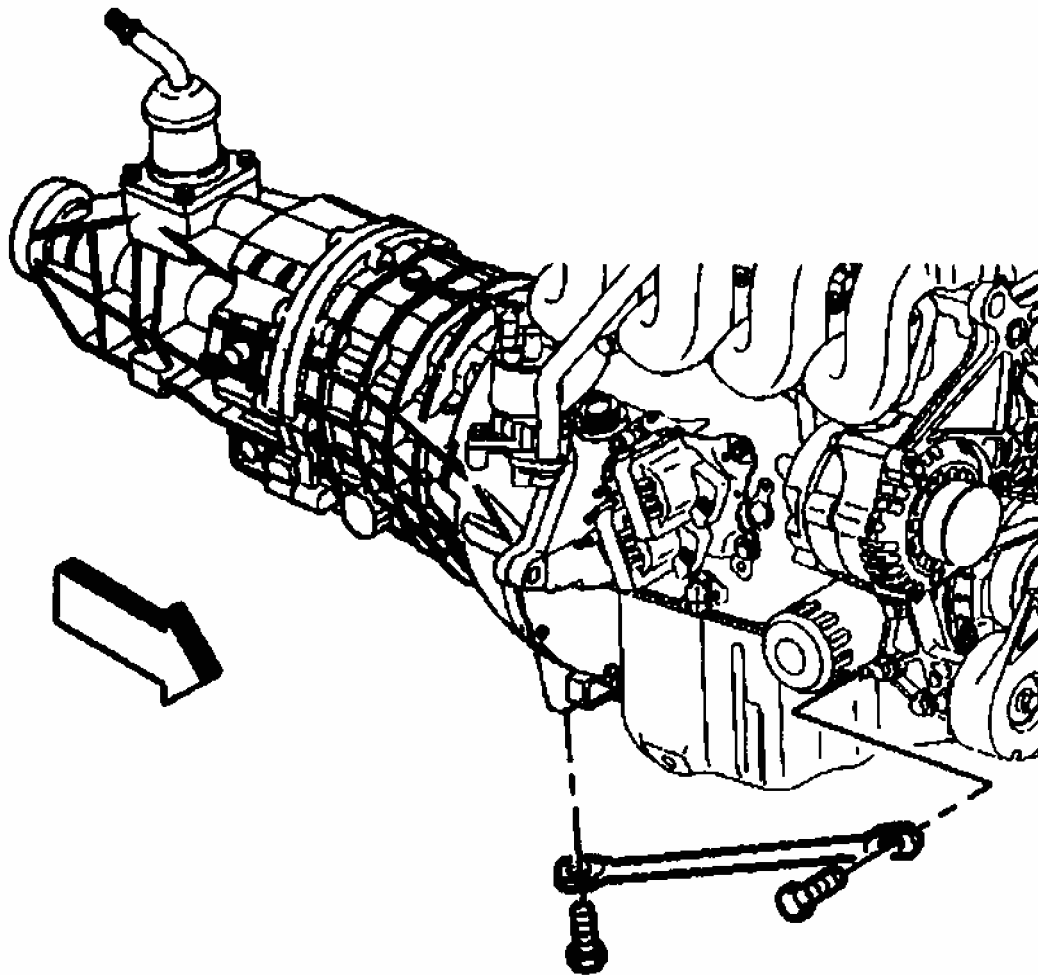
5. Install the transmission rear mount. See **TRANSMISSION MOUNT REPLACEMENT** .
6. Install the clutch line to the concentric slave cylinder.



G01840458

Fig. 53: Installing Concentric Slave Cylinder Clutch Line

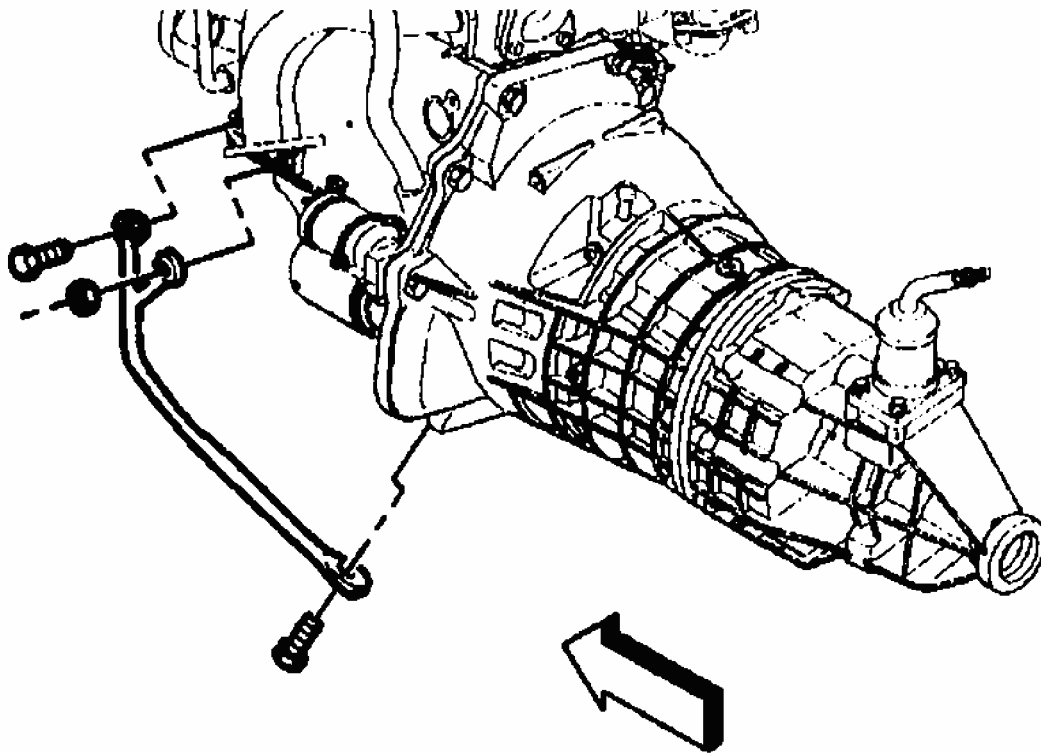
7. Install the two bolt securing the right side support to the transmission and engine. Tighten the bolts to 50 N.m (37 lb ft).



G01840459

Fig. 54: Installing Right Side Transmission-To-Engine Brace Bolts

8. Install the two bolts and nut securing the left side support brace to the transmission and engine. Tighten the bolts and nuts to 50 N.m (37 lb ft).



G01840460

Fig. 55: Installing Left Side Transmission-To-Engine Brace

9. Install the exhaust manifold pipe.
10. Install the Rear Driveshaft .
11. Install the shift tower. See **SHIFT TOWER REPLACEMENT** .
12. Fill the transmission with transmission fluid. See **LUBRICATION SPECIFICATIONS** .
13. Install the shift lever. See **SHIFT LEVER REPLACEMENT** .

DESCRIPTION & OPERATION

TRANSMISSION SYSTEM DESCRIPTION & OPERATION

The RPO code for the NV1500 is MW2. The NV1500 transmission is synchronized in all five gears. The NV1500 transmission has a 2 piece aluminum housing that contains the following components:

- The Input Shaft
- The Mainshaft

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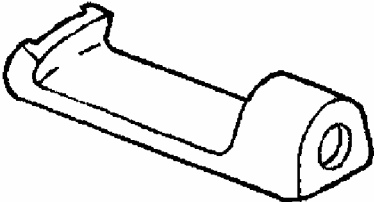
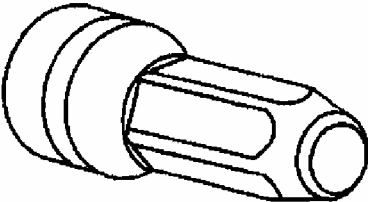
- The Mainshaft Gears
- The Countershaft
- The Reverse Idler Gear
- The Shift Forks
- The Shift Shaft Components

The NV 1500 transmission is used in trucks with the 2.2 L engine.

SPECIAL TOOLS & EQUIPMENT

2001 Chevrolet S10 Pickup

2001 MANUAL TRANSMISSIONS Manual Transmission - NV 1500 - Sonoma & S10 Pickup

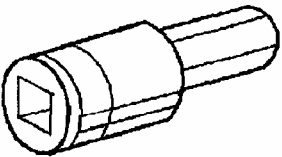
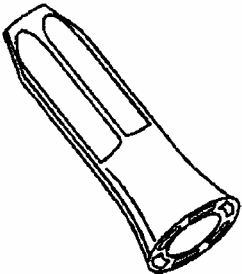
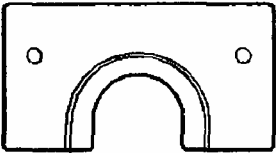
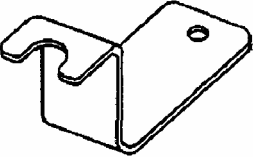
Illustration	Tool Number/Description
	J 6125-B Slide Hammer
	J 23129 Universal Seal Installer
	J 36503 Output Shaft Seal Installer

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Fig. 56: Special Tools & Equipment (1 Of 2)

2001 Chevrolet S10 Pickup

2001 MANUAL TRANSMISSIONS Manual Transmission - NV 1500 - Sonoma & S10 Pickup

Illustration	Tool Number/Description
	J 36511 Oil Fill Plug Hex Bit (17 mm)
	J 38801 Input Shaft Seal Installer
	J 41371 Reluctor Gear Puller
	J 42371 Clutch Line Connector Removal Tool

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Fig. 57: Special Tools & Equipment (2 Of 2)